Three Essays on Managerial Behavioral Biases

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Valentin Burg

An introductory summary

The seminal paper by Kahneman and Tversky (1979) introduced a new line of thought in finance research. Since then many papers analyze economic choices based on assumptions that depart from perfect rationality. Some of these assumptions are based on research in psychology and neuroscience and are helpful in explaining many aspects of economic decision making. In particular, this field of research analyzes how cognitive biases can impact individual behavior.[1] This thesis investigates the effect of managerial biases on corporate financial policies. It consists of three essays analyzing empirically the effect of managerial optimism on debt contract design and corporate payout policy as well as the impact of managerial overconfidence on corporate speculation with derivatives.

The concept of optimism emerged from research in psychology and refers to the so-called "better-than-average" phenomenon that describes that individuals are prone to overestimate their abilities relative to others. Svenson (1981), for example, documents how individuals overestimate their driving skill and shows that a majority of people interviewed believe they are better than the average driver. Optimism has been found to be particularly prevalent among corporate executives.[2] This finding may originate from the fact that an executive's performance is difficult to evaluate, that executives are highly committed to their tasks and believe that they are able to control their companies' success.

Research in finance and economics started to analyze the concept of optimism in the 1980s. Roll (1986) shows how managerial optimism can drive corporate takeover activity where bidding firms pay too much for target firms. More recently, a number of studies documents a relation between manage-

[1] Barberis and Thaler (2003) and Baker and Wurgler (2012) provide excellent overviews over this research area.

[2] See Kidd (1970), Larwood and Whittaker (1977), and Moore (1977) for evidence of optimism among managers.

rial optimism and corporate financial policies empirically.[3] These studies use executive compensation information to examine whether a specific manager is optimistic or rational. A manager who is optimistic and overestimates his abilities will also overestimate his firm's future expected cash flow which makes him believe that his firm is undervalued. Malmendier and Tate (2005) use this idea and identify managers as optimistic if they ever hold executive stock options until one year prior to maturity even though these options are deep in the money. The rationale is that managers who typically have a large fraction of personal wealth tied to their company and only limited diversification abilities across alternative investments should rationally exercise an option once it is in the money and exercisable. Only executives who are extremely optimistic about their firm's future return would decide not to do so in these situations. Classifying executives into optimistic and rational requires therefore information about an executive's option portfolio. In this dissertation, this information is taken from ExecuComp (chapter 1 and 3) or is hand collected from firms' proxy statements (chapter 2) for the companies' CEOs and CFOs. The classification is described in more detail in the Appendix. In the following, the three essays included in the thesis are summarized.

The first paper (with Tim R. Adam, Tobias Scheinert, and Daniel Streitz) investigates the impact of managerial optimism on debt contract design. The analysis focuses on performance-sensitive debt contracts (PSD), i.e., debt contracts with coupon payments that are adjusted following changes in the borrower's credit risk. If the credit risk increases (decreases), coupons are increased (decreased) to pre-specified levels. In exchange, the borrower pays a lower (higher) initial spread. Manso, Strulovici, and Tchistyi (2010) show

[3] For example, Malmendier and Tate (2005) show that optimistic managers have higher cash flow investment sensitivities and prefer to finance projects internally. Malmendier and Tate (2008) investigate the effect of optimism on takeover activity and find that optimistic managers overpay for target firms and prefer internal financing to finance their acquisitions. Malmendier, Tate, and Yan (2011) find that optimistic managers are more likely to follow pecking-order financing choices and are reluctant to issue funds externally.

theoretically that high quality borrowers will select PSD contracts to credibly signal their type and benefit from lower initial spreads and from lower coupon payments in the future. On the other hand, low quality borrowers are not able to do so because this option is too costly for them as they know that they would have to pay higher coupons in the future. Thus, PSD can be used as a screening mechanism for banks to distinguish between high and low quality borrowers. We predict that firms with optimistic managers are in general more likely to select PSD contracts than their rational counterparts. Optimistic managers overestimate their firms' future cash flows and therefore also the likelihood that the credit quality of their firms will improve. Consequently, they perceive themselves as good types and pool with higher quality borrowers to benefit from better funding terms.

Our empirical evidence is in line this hypothesis. Firms managed by optimistic CEOs are more likely to choose PSD. Within the set of PSD contracts, optimistic managers choose PSD with a higher performance-pricing sensitivity than rational managers. That is, contracts with greater punishments for performance deterioration. Consistent with an overestimation of credit quality, we furthermore find that firms with optimistic managers are significantly more likely to experience a performance deterioration, i.e., credit quality decreases, after the loan issue than firms with rational managers. This finding also rules out that optimistic managers have positive inside information rather than upwardly biased beliefs on their firms credit quality. Overall, our findings show that managerial optimism is an important determinant in a firm's debt contracting policy and directly impacts the chosen instrument and its risk features.

The second paper (with Tim R. Adam) analyzes the relation between managerial overconfidence and corporate speculation with derivatives.[4] Géczy, Minton, and Schrand (2007) analyze survey data and find that 40% of surveyed firms use derivatives to speculate at "least sometimes". This result is surprising given that most derivative transactions take place in efficient markets such as interest rate or foreign exchange markets. In this paper, we argue that overconfidence might be a driver of corporate speculation using derivatives. Overconfident managers overestimate their abilities relative to others and are likely to believe to have superior market timing abilities. In addition, if overconfident managers bet on market movements based on *false* beliefs of having superior market timing abilities, we expect that speculation should lead to speculative losses.

In our analysis, we use a unique dataset on hedge derivatives in the gold mining industry. Analyzing derivative usage in the gold mining industry is particularly interesting because (i) gold producers have a clear risk exposure to the gold price and at the same time a variety of gold hedge instruments at their disposal and because (ii) gold producers' public disclosure on derivative holdings provides superior information on derivative holdings compared to other industries.[5] Using this information together with information on firms' gold reserves and production figures allows calculating a hedge ratio, which provides a good proxy of how much of the company's estimated future gold production is hedged using derivatives. We measure corporate speculation using the time variation in the hedge ratio over the last four quarters. The in-

[4] This paper uses the optimism classification described above to identify managers as overconfident. Otto (2014) shows that optimism and overconfidence are highly correlated biases among managers.

[5] Contrary to most other industries, firms in the gold mining industry disclose information on the type of derivatives held (e.g., option contract or forward contract), maturity of instruments as well as forward or strike prices.

tuition is that firms have few incentives to vary their hedge ratios significantly over a short horizon.[6]

The empirical analysis in this paper confirms the empirical predictions mentioned above. We find that CFO overconfidence is related to higher variation in hedge ratios and that speculative losses are significantly higher for firms with overconfident CFOs. In contrast, CEO overconfidence is not related to higher variation in hedge ratios or to speculative losses. This result is consistent with the idea that it is mainly the CFO who is responsible for financial decisions of a firm such as hedging.

The third paper documents a relation between CEO optimism and corporate payout policy. The question whether corporations should pay out excess cash via dividends or share repurchases has been subject of a number of studies in the last two decades, however, there is no conclusive answer so far (Baker, Powell, and Veit (2002)). While most existing studies focus on firm characteristics, we argue that managerial optimism is likely to affect how a firm distributes excess cash. Optimistic managers persistently perceive their firm as undervalued because they overestimate their abilities in managing the firm. This has direct implications for the payout policy of a firm managed by an optimistic manager: (i) Raising external funds is perceived as unduly costly to optimistic managers and therefore the firm should rely on internal cash to finance investment. Consequently, these firms should pay out less to shareholders relative to firms with rational managers. (ii) Because optimistic managers perceive their firm's equity as undervalued, buying back shares is seen as a positive NPV project.

[6] We are aware that changes in firm fundamentals could explain some of this variation. We rule out that our results are driven by changes in firm fundamentals by using the residual of the hedge ratio (estimated using standard hedge ratio regressions) to calculate the variation in the *unexplained* part of the hedge ratio. Our results remain unaffected.

Both arguments are expected to have an impact on the payout channel design of a company managed by an optimistic manager. While the first argument applies to both dividends and share repurchases, the second argument is only valid for repurchases. If optimistic managers rely more on internal cash flow, they should pay out less. The effect on share repurchases, however, is less clear: If the undervalued equity argument dominates the costly external financing argument, then optimistic managers should use more share repurchases relative to rational managers and vice versa. However, conditional on paying out cash, optimistic managers should always prefer share repurchases over dividends.

The empirical results in this paper provide support for the hypotheses presented above. We find that firms with optimistic CEOs pay out 8-10% more in form of share repurchases relative to firms managed by rational CEOs. In addition, we find that optimistic CEOs also repurchase more shares in terms of total assets. On the other hand, we do not find significant differences in total payouts between firms with rational and optimistic CEOs confirming prior results in a study by Deshmukh, Goel, and Howe (2013).

To summarize the results of the thesis, managerial biases such as optimism and overconfidence can have an important impact on corporate financial policies. The thesis presents three additional policies where managerial biases are found to play a role. The thesis thereby extends the relatively new literature on the impact of behavioral biases, especially managerial optimism and overconfidence, on corporate financial policies.

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Managerial Optimism and Debt Contract Design

Tim R. Adam Valentin Burg Tobias Scheinert Daniel Streitz

Abstract:

We examine the impact of managerial optimism on the inclusion of performance-pricing provisions in syndicated loan contracts (PSD). Optimistic managers may view PSD as a relatively cheap form of financing given their upwardly biased expectations about the firm's future cash flow. Indeed, we find that optimistic managers are more likely to issue PSD, and choose contracts with greater performance-pricing sensitivities than rational managers. Consistent with their biased expectations, firms with optimistic managers perform worse than firms with rational managers after issuing PSD, which implies that ex-pot PSD was an expensive form of financing for optimistic managers. Our results show for the first time that behavioral aspects can affect contract design in the market for syndicated loans.

Keywords: Behavioral Bias, Optimism, Performance-Sensitive Debt, Debt Contracting, Syndicated Loans

JEL-Classification: G02, G30, G31, G32

1 Introduction

"The market was giving us a reduction in basis points on the coupon, and we felt there was no probability of violating the covenants [i.e., the performance-pricing thresholds]."–John Bowen, Morton International Inc., Investment Dealers' Digest, June 1990.

In 1990, Morton International issued performance-sensitive debt (PSD), which stipulated that the coupon would rise if Morton's credit rating were to deteriorate. In return, Morton received a lower initial coupon than without this performance-pricing provision. The above quote indicates that at the time of this debt issue the CFO of Morton International, John Bowen, considered it to be highly improbable that Morton would be downgraded. Unfortunately, he was wrong. During the life of this debt contract, Morton was downgraded several times, from AA to BBB. Obviously, this may have been bad luck. On the other hand, Morton's CFO may have had overly optimistic expectations about the firm's future performance, and due to these expectations included a performance-pricing provision in the debt contract. This paper therefore aims to explore in a systematic manner whether managerial biases, such as optimism, impact the use of performance-pricing provisions.

Manso, Strulovici, and Tchistyi (2010) hypothesize that performance-sensitive debt (PSD) can be used to signal a firm's unobservable information about its credit quality to potential lenders. Lenders, who cannot distinguish between high and low quality firms, offer borrowers a menu of contracts, which includes fixed-rate debt and risk-compensating PSD. High quality firms choose PSD because the initial coupon rate is lower compared to fixed-rate debt. Low quality firms, on the other hand, will not mimic high quality firms as low quality firms expect their credit qualities to deteriorate in the future, which would trigger coupon rate increases and thus higher borrowing costs compared

to straight debt contracts. In the resulting separating equilibrium high quality firms issue PSD, while low quality firms issue straight debt.

We argue that optimistic managers, who persistently overestimate their firms' future expected cash flow, may (irrationally) decide to mimic high quality firms and issue PSD in order to benefit from the relatively low initial coupon rate offered by lenders on PSD. This possibility gives rise to a number of new testable hypotheses, which we evaluate in this paper. First, optimistic managers should exhibit a greater likelihood of using PSD than rational managers because optimistic managers should prefer PSD regardless of firm type. Second, optimistic managers may choose PSD contracts with more risk-compensation, that is, contracts with a higher sensitivity of the coupon rate to performance changes, than rational managers on average. This is because contracts with more risk-compensation offer lower initial coupon rates. Finally, the post-issue performance of PSD-issuing firms led by optimistic managers should be worse than the post-issue performance of PSD-issuing firms led by rational managers, due to the biased expectations of optimistic managers.

We examine these hypotheses using a sample of syndicated and non-syndicated loan tranches issued between 1992 and 2010, obtained from the LPC Dealscan database. Asquith, Beatty, and Weber (2005) report that the use of performance-pricing provisions has become widespread since the early 1990s. In Adam and Streitz (2014), 47% of loans reported in Dealscan contain performance-pricing provisions.

The terms managerial optimism and overconfidence have been used inconsistently in the literature. We define managerial optimism to mean that the executive persistently overestimates the firm's future expected cash flow. Of course, future cash flow expectations are not observable. We therefore follow the methodology discussed in Malmendier and Tate (2005a) and classify CEOs as optimistic if they ever hold an option until maturity, which is at

least 40% in-the-money at the year-end prior to maturity. The rationale behind this measure is that CEOs who typically have a large fraction of personal wealth tied to their companies and only limited diversification abilities across alternative investments should rationally exercise an option once it is in-the-money and exercisable. Only executives who are overly optimistic about their firm's future return would decide not to exercise their stock options in these situations.

Our results are consistent with the above empirical predictions. Optimistic CEOs are 6% more likely to issue PSD than rational CEOs.[1] This is economically significant given an overall mean of about 50%. Furthermore, optimistic managers choose PSD with a higher performance-pricing sensitivity than rational managers. That is, contracts with greater punishments for performance deterioration. Finally, we find that firms with optimistic managers perform worse after the issuance of PSD compared to firms led by rational managers. This result rules out the possibility that the managers, which we classify as optimistic, possess positive inside information about their company's future performance. If this were true, issuing PSD could be a rational choice driven by different information sets and not by differences in opinions. In fact, our result suggests that the issuance of PSD has been harmful for firms run by optimistic managers. All our results are robust to various optimism measures and to the inclusion of other manager characteristics such as age, tenure, or education.

A potential concern with our analysis is that a firm's choice to hire an optimistic CEO may be endogenous. This decision might be correlated with the same variables that also affect the decision to issue PSD. We address this

[1] The CEO is likely to be involved in the design of these debt contracts because the average loan in our sample is large and represents about 30% relative to outstanding debt. Furthermore, given that the performance-pricing provision is viewed as a costly signal, it can have a large negative impact on the firm's future financial situation (see Manso et al. (2010)). According to Hambrick and Mason (1984) CEO optimism can also affect a firm's corporate culture in general and hence the willingness to bear risks.

issue in two ways. First, we model the firm's choice to hire an optimistic CEO using a propensity score matching approach, that is, we match each firm that is managed by an optimistic CEO to a firm that is equally likely to be managed by an optimistic CEO but is indeed managed by a rational CEO. Our results are qualitatively unaffected. The main drawback of this procedure is that we can only match based on observable characteristics. In a second step, we therefore control for unobservable (time-invariant) firm characteristics by testing whether the policy to issue PSD changes after CEO turnover with optimistic successors. We find that optimistic CEOs increase the issuance of PSD after being hired while incoming rational CEOs decrease the fraction of PSD issues. The difference between these two groups is highly significant.

We contribute to three strands of the literature. First, our results extend the existing literature on the impact of managerial biases on corporate financing decisions. For example, Malmendier, Tate, and Yan (2011) and Graham, Harvey, and Puri (2013)) show that managerial optimism affects firms' capital structure decisions.[2] The study that is closest to ours is Landier and Thesmar (2009). The authors analyze the debt capital structure of small firms and find that optimistic entrepreneurs prefer lines of credit over longer term bank debt. Our study differs from this analysis in several fundamental ways. First, the decision to issue PSD is not equivalent to debt maturity choice, because short-term debt exposes the borrower to changes in the market credit risk premium, while PSD locks-in the current market risk premium for the duration of the loan. Second, we show that managerial biases can affect debt contract design in large public corporations. Finally, we examine the effect of managerial opti-

[2] See also Ben-David, Graham, and Harvey (2013), Campbell, Gallmeyer, Johnson, Rutherford, and Stanley (2011), Deshmukh, Goel, and Howe (2013), Ferris, Jayaraman, and Sabherwal (2013), Galasso and Simcoe (2011), Gervais, Heaton, and Odean (2011), Goel and Thakor (2008), Hirshleifer, Low, and Teoh (2012), Lowe and Ziedonis (2006), Malmendier and Zheng (2012) and Otto (2014). Baker, Ruback, and Wurgler (2004) provide an excellent survey on behavioral corporate finance.

mism on firm performance, documenting negative consequences of contracting by optimistic managers for the corporation.

Second, to the best of our knowledge, our study is the first to show that managerial biases can have a significant impact on the structure of syndicated loans. The prior literature has focused solely on neoclassical theories. For example, Bharath, Dahiya, Saunders, and Srinivasan (2011), Ivashina and Kovner (2011), and Prilmeier (2011) show that repeated interactions between borrowers and lenders can reduce information asymmetries, which can impact loan contract terms. Dass, Nanda, and Wang (2011) document that agency problems affect the syndicate structure. Erel, Julio, Kim, and Weisbach (2012) and Qian and Strahan (2007) analyze how macroeconomic conditions and laws and institutions shape debt contracts.[3] We add to this literature by showing that behavioral biases can also affect syndicated loans.

Third, we contribute to the literature on performance-pricing provisions in corporate debt contracts. Asquith et al. (2005) argue that PSD is used to reduce debt renegotiation costs, while Manso et al. (2010) show that PSD can be used as a signaling device for a firm's credit quality. Other studies document a link between PSD and earnings management (Beatty and Weber (2003)), manager equity incentives (Tchistyi, Yermack, and Yun (2011)), and relationship lending (Adam and Streitz (2014)). Our paper is the first to establish a link between the use and design of PSD and managerial optimism.

The remainder of the paper proceeds as follows. Section 2 presents our hypotheses, while Section 3 describes the sample. Section 4 contains the empirical analysis of the impact of managerial optimism on PSD contract terms. In Section 5 we test the robustness of our results, and Section 6 concludes.

[3] This discussion is not meant to be exhaustive, as the literature on syndicated loans is very large.

2 Hypothesis Development

In performance-sensitive debt (PSD) the coupon rate is a deterministic function of the issuer's performance. The coupon rises if the borrower's performance deteriorates and/or falls if the borrower's performance improves. Manso et al. (2010) show that PSD can be used as a screening device in a setting with asymmetric information between borrower and lender. In their model, the growth rate of the cash-flow process of a firm is private information and depends on the firm's quality. The lender, who cannot observe the true quality (cash-flow growth rate) of a potential borrower, offers a menu of contracts, which includes fixed-rate debt and risk-compensating PSD. In the resulting separating equilibrium low-growth firms choose to issue fixed-rate debt, while high-growth firms choose to issue risk-compensating PSD. The low-growth firm has no incentive to deviate from this equilibrium because despite the initially low coupon rate offered on PSD, PSD subjects the low-growth firm to coupon rate increases in the future when its true type is revealed. Thus, low-growth firms would face higher borrowing costs overall if they were to issue PSD rather than regular debt.

In their model, Manso et al. (2010) assume that the manager of a firm correctly assesses the cash-flow growth rate of his firm and chooses the debt contract according to this expectation. However, the recent literature questions this assumption (e.g., Malmendier and Tate (2005a)). In particular, *optimistic* managers could persistently overestimate the firms' cash-flow growth rate, while *rational* managers correctly assess the firms' cash flow growth rate on average. As a result, optimistic managers of low-growth firms may now decide to pool with rational managers of high-growth firms.[4] This implies that optimistic managers are more likely to issue PSD than rational managers.

[4] The pooling of optimistic managers with rational managers of high-growth firms preserves the general separating equilibrium as long as there are not too many optimistic managers.

Hypothesis 1: *Optimistic managers are more likely to issue risk-compensating PSD than rational managers.*

Note that for *Hypothesis 1* to hold, we do not require the assumption that the average quality of the firms managed by optimistic managers is different from the quality of firms managed by rational managers. We only require that there are firms for which it is optimal to issue PSD and firms for which it is optimal to issue fixed-rate debt in both groups. Then some low-growth firms that are managed by optimistic managers will issue PSD, as the optimistic manager overestimates the firm's cash flow growth rate and thus overestimates the value of the option implicit in the performance-pricing provision. Low-growth firms managed by rational managers will choose fixed-rate debt because the initially reduced coupon is not sufficient to compensate for the expected costs of being downgraded.

Our theory builds on the assumption that optimistic managers are overly optimistic and do not possess superior knowledge of their firms' cash flow growth rate. If this is the case, then the post-issue firm performance of optimistic managers should be worse than the post-issue firm performance of rational managers using PSD. Put differently, *Hypothesis 1* stipulates that some low-growth firms with optimistic managers choose PSD contracts and pool with high-growth firms that have rational managers. Therefore, the set of firms with rational managers that have issued PSD contracts solely consists of high-growth firms, while the set of firms with optimistic managers that have issued PSD contracts consists of both high-growth and low growth firms. This gives rise to our second hypothesis.

Hypothesis 2: *The performance following a PSD issue is worse for firms managed by optimistic managers than for firms managed by rational managers.*

3 Data Description

3.1 Managerial Optimism

We start by classifying CEOs as either rational or optimistic following Malmendier and Tate (2005a), that is, we measure optimism based on executive option holdings. We use ExecuComp to obtain information on executive stock option grants, exercised options, and option holdings. We restrict our sample to the 1992 to 2010 period and exclude financial firms (SIC codes 6000-6999). As ExecuComp contains option exercises only in an aggregated form and not on the grant level, we follow Hall and Liebman (1998) and apply a FIFO-algorithm to construct the option portfolios in a given year.[5] Thereby executives are classified as optimistic if they ever hold an option until maturity, which is at least 40% in-the-money at the year-end prior to maturity.[6] Thus, optimism is considered as an inherent, time-invariant personal characteristic of an executive.

The intuition for relying on the executives' option exercise behavior as a means of classification into rational or optimistic managers is the following: Executives face a trade-off between exercising their options or keeping the options for later exercise. By keeping the options, they maintain the right to purchase company stock at potentially more favorable conditions in the future. The downside of this strategy is that it involves substantial costs for the executive in terms of exposure to idiosyncratic risk. Executive stock options typically have a maturity of ten years and become vested after two to four years. Furthermore, diversifying this exposure is problematic as executives are legally prohibited from short-selling their company's stock. Given the

[5] See Appendix 1 in Hall and Liebman (1998) for further details.

[6] The threshold is derived according to Hall and Murphy (2002) by using a constant risk aversion parameter of 3 and 67% of wealth in company stock. The original Malmendier and Tate (2005b) classification does not require a minimum threshold for in-the-moneyness and solely requires option holding until maturity.

large fraction of personal wealth tied to their company, diversification abilities across alternative investments are also limited. Lastly, besides the financial exposure, also a substantial fraction of the executive's human capital is tied to the company (Malmendier and Tate (2008)). Consequently executives can be considered as under-diversified investors, who have a large exposure to their company's risk. Thus, rational executives should divest as soon as the option is sufficiently in-the-money because the cost of delayed exercise typically exceeds its option value. In contrast, executives who are optimistic and therefore overestimate the firm's future return may fail to exercise their stock options in these situations.

3.2 Loan Sample

We obtain loan contract information from LPC Dealscan for all companies for which the CEO of the borrowing firm can be classified as optimistic or rational.[7] We additionally merge our loan deal panel to COMPUSTAT to obtain financial information on the borrowers.[8] We refer to the Appendix for a detailed description of the control variables used.

Dealscan reports information on performance pricing provisions included in loan contracts. In particular, Dealscan reports the pricing grid, that is, a step function schedule linking the interest payments to a measure of financial performance.[9] We define a dummy variable, PSD, which equals one if a loan contract includes a performance-pricing provision and zero otherwise. We further distinguish between interest-increasing, interest-decreasing, and mixes

[7] As common in the literature the loan panel is created on the facility (tranche) level (e.g., Berg, Saunders, and Steffen (2013), and Bharath, Dahiyab, Saunders, and Srinivasan (2007)).

[8] We use the link provided by Michael Roberts to merge Dealscan with COMPUSTAT (see Chava and Roberts (2008) for details). We obtain borrower information from the last available fiscal year before the loan issue.

[9] The most common financial measure used in PSD contracts reported in Dealscan is the debt-to-EBITDA ratio ($\sim$ 50% of all PSD loans issued by US borrowers) followed by the senior debt rating ($\sim$ 25%). Other less commonly used measures are the interest coverage ratio, the fixed charge ratio or leverage. A minority of PSD deals uses multiple performance criteria.

PSD. In interest-increasing contracts the coupon rate on the loan mostly increases if the borrower's creditworthiness declines. Interest-decreasing and mixed PSD are defined accordingly. In particular, we define the following ratio:

$$\textit{Rate De-/Increase} = \frac{S_{Initial} - S_{Min}}{S_{Max} - S_{Min}}. \tag{1}$$

$S_{Initial}$ is the interest rate paid at contract inception and S_{Max} (S_{Min}) is the highest (lowest) interest rate defined in the pricing grid. *Rate De-/Increase* is zero (one) if the pricing grid allows for interest increases (decreases) only. Contracts with a ratio between zero and one allow for both interest rate increases and interest rate decreases. We define indicator variables for terciles of this ratio to categorize PSD contracts into (mainly) rate-increasing, mixed, and (mainly) rate-decreasing.[10] Disentangling rate-increasing and rate-decreasing PSD is important as our main hypotheses are derived for rate-increasing PSD.[11]

Figure 1 shows the pricing grid of a loan issued by IBM in March 2004 as an example. In this contract, the interest rate changes with IBM's senior debt rating. Since IBM's senior debt rating at the time of the issue was A+, this loan is an example of a mixed PSD contract.

[Figure 1 here]

[10] For robustness we replicated all our specifications defining only contracts as rate-increasing (rate-decreasing) if *Rate De-/Increase* is exactly equal to zero (one). The remaining PSD contracts, that is, contracts with *Rate De-/Increase* between zero an one, are defined as mixed. All our results remain unchanged if we use this alternative definition.

[11] The use of rate-decreasing PSD can be motivated by other reasons. For example, Asquith et al. (2005) argue that rate-decreasing PSD is a prepayment option for the borrower, which does not require renegotiation. The interest rate is automatically reduced if there are unanticipated improvements in the borrower's performance, thereby lowering renegotiation costs.

3.3 Descriptive Statistics

We provide descriptive statistics for borrower and loan characteristics in Table 1. We divide the sample into firms managed by optimistic and rational managers. Panel A reports descriptives for borrower characteristics. Unsurprisingly, the companies in our sample are large. By relying on information from the ExecuComp database, which covers all companies listed in the S&P 1,500, we effectively restrict our sample to large public US companies. Borrowers with CEOs that are classified as optimistic are on average smaller compared to borrowers with CEOs that are classified as rational. The mean/median size is \$7,452/\$2,225 million USD for rational borrowers and \$6,502/\$2,136 million USD for optimistic borrowers. The other borrower characteristics are similar. Panel B.1 provides descriptive statistics for general loan characteristics. Consistent with *Hypothesis 1*, we find that the fraction of PSD contracts is 4% higher in the sample of loans issued by optimistic CEOs when compared with loans issued by rational CEOs (57% vs. 53%). The median loan amount is \$250 for both groups and also the median maturity is similar (about 5 years). Panel B.2 provides descriptive statistics for the subset of performance-sensitive loans. Within PSD contracts firms managed by optimistic managers in particular issue more rate-increasing PSD if compared to firms managed by rational managers.

[Table 1 here]

4 Managerial Optimism and Performance - Sensitive Debt

4.1 Performance-Sensitive vs. Straight Debt

In this section, we analyze the relationship between managerial optimism and the use of PSD. We begin by estimating the following Logit regression specification:

$$PSD_{it} = \alpha + \beta * Optimistic_{it} + \gamma * X'_{it-1} + \delta * Y'_{it} + \epsilon_{it}. \quad (2)$$

The dependent variable, PSD, is a dummy variable, which equals one if the loan contract includes a performance-pricing provision and zero otherwise. *Optimistic* indicates whether the borrowing firm is managed by an optimistic CEO. X is a set of borrower characteristics and Y a set of loan characteristics.[12] We also include industry (2-digit SIC code), year, rating (notch), loan type, loan purpose, and bank fixed effects.

[Table 2 here]

The results reported in Table 2 indicate that managerial traits may significantly impact the firms' decision to issue PSD. Loans issued by optimistic CEOs are about 6% more likely to contain performance-pricing provisions than loans issued by rational CEOs. Smaller firms are also more likely to issue PSD than larger firms. Furthermore, larger loans and loans that have a longer maturity are more likely to contain performance-pricing provisions. These findings are consistent with the existing literature, which argues that PSD can be used to overcome asymmetric information problems (see Asquith et al. (2005),

[12] As noted in the data section, we obtain borrower information from the last available fiscal year *before* the loan issue ($t-1$).

Manso et al. (2010)), which are more significant in larger loans and loans of longer maturities.

Next, we examine whether the higher likelihood of using PSD by optimistic managers is driven by rate-increasing or rate-decreasing PSD. To do so, we estimate a multinomial logit model, in which the dependent variable can take on four values: 0 for straight debt, 1 for (mainly) rate-increasing PSD, 2 for mixed PSD, and 3 for (mainly) rate-decreasing PSD.

[Table 3 here]

Table 3 shows that the effect reported in Table 2 is solely driven by a preference of optimistic managers for rate-increasing PSD contracts. Optimistic managers are about 2% more likely to use rate-increasing PSD, while we find no significant correlation between optimism and mixed or rate-decreasing PSD. Overall, these findings are consistent with *Hypothesis 1*.

4.2 PSD Pricing-Grid Structure

The previous section has shown that optimistic managers are more likely to issue PSD than rational managers. Given that optimistic managers overestimate their firms' future cash flow growth rates and thus overestimate the value of the option implicit in the performance-pricing provision, optimistic managers may be tempted to sell more options, which they perceive as being overvalued. We therefore analyze the structure of the PSD pricing grids in more detail in this section. Figure 2, shows the average pricing grid of firms with optimistic and rational CEOs. The graph indicates that the difference between the maximum and the minimum coupon rate is on average higher if the CEO is optimistic than if the CEO is rational.[13] Of course, the graphical evi-

[13] The median credit rating at the time of the loan issue is BBB+ for both optimistic and rational CEOs, suggesting that the differences in the pricing grids are not driven by differences in the riskiness of the issuing firms.

dence serves as a first indication only, as borrowers with optimistic CEOs and borrowers with rational CEOs are not unconditionally comparable (borrower and loan characteristics may differ).

[Figure 2 here]

To analyze the PSD structure in a more refined way, we follow Tchistyi et al. (2011) and calculate the slope of the pricing grid of a PSD contract. The slope relates coupon rate changes resulting from changes in the issuer's credit rating to differences in market interest rates over the same rating changes.[14] A slope of one implies that the pricing grid reflects the market interest rate structure at origination of the loan issue. A slope measure greater than one indicates that the coupon rate is more sensitive to rating changes than market interest rates at origination of the loan issue. To differentiate between up- and downgrade effects we further calculate slope measures separately for the rate-increasing and the rate-decreasing regions of the pricing grid. Similar to Tchistyi et al. (2011), we calculate the slope "locally" (pricing steps directly adjacent to the initial interest rate) and as the average slope over the pricing grid. The local slope is defined as follows:

$$LocalSlope = 0.5 * \left(\frac{(S_{i+1} - S_i)}{(Bond_{i+1} - Bond_i)} + \frac{(S_i - S_{i-1})}{(Bond_i - Bond_{i-1})} \right), \quad (3)$$

where S_i is the coupon rate that the borrower pays at the initial rating i. S_{i+1} (S_{i-1}) is the coupon rate, which the borrower pays at the next higher rating (lower) rating notch. $Bond_i$ denotes a bond market index at rating i. We use the Bloomberg Bond Market Index for the construction. The average slope is calculated similarly by using all interest rate changes defined in the pricing grid. Figure 3 illustrates this procedure. $Bond_i$, $Bond_{i+1}$, and $Bond_{i-1}$ are the levels of the bond market index for the respective rating notches at the

[14] Since market interest rates are available only for particular rating classes, we can calculate slope measures for rating-based PSD only.

time of the loan issue. We use the level of the Bloomberg Bond Market Index for each rating notch at the time of loan issue. As noted above the average slope is calculated similarly by using all interest rate changes defined in the pricing grid. Figure 3 illustrates this procedure.

[Figure 3 here]

The OLS regression results relating the slope of rating-based PSD contracts to managerial optimism are reported in Table 4. We follow Tchistyi et al. (2011) and define the slope of fixed rate debt to be zero.[15] We address skewness in the slope measure by using $ln(Slope)$ in the regressions.

[Table 4 here]

As shown in Table 4, we find that loans issued by optimistic CEOs have significantly larger local slopes over regions of rating downgrades. This means that optimistic CEOs choose pricing provisions that allow for larger interest rate increases (relative to the market yield) than PSD contracts chosen by rational CEOs. Results for the average slope measures are similar to those for the local slope measures. To summarize, optimistic CEOs choose pricing grids with steeper slopes compared with the slopes of the pricing grids chosen by rational CEOs.

4.3 Post-Issue Performance

In this subsection, we test whether firms with optimistic managers perform worse after issuing rate-increasing PSD relative to firms with rational managers (*Hypothesis 2*). In particular, we estimate the following model:

$$\Delta Performance_{it+k} = \alpha + \beta_1 * Optimistic_{it} + \gamma * X'_{it-1} + \delta * Y'_{it} + \epsilon_{it}. \quad (4)$$

[15] Both the economic and statistical significance of our results remains unaffected if we use a Tobit specification with zero as the lower bound.

$\Delta Performance_{it+k}$ is the change in financial performance of the borrower k years after the issue ($k = 1, 2$).[16] We use two different measures of firm performance: the debt-to-EBITDA ratio and the firm's credit rating. These two measures are the two most commonly used performance measures in PSD contracts.[17] The regression includes rate-increasing PSD contracts only.[18] We focus on rate-increasing PSD because as shown in Table 3, managerial optimism is related to the use of rate-increasing PSD only. Table 5 presents the regression results.

[Table 5 here]

The results in Columns 1 and 2 show that the debt-to-EBITDA ratio of firms with optimistic CEOs increases in the years following a PSD issue relative to firms with rational CEOs. This effect is economically large. A change of 0.4 (Column 1) represents about one half of the standard deviation of the debt-to-EBITDA ratio. This suggests that the performance (here: leverage) of these firms deteriorates significantly after the loan issue, leading to higher interest payments. In Columns 3 and 4, the dependent variable is a dummy variable, which equals one if the issuer is downgraded following the loan issue and zero otherwise. The results show that the credit rating of firms with optimistic CEOs is about 5% more likely to be downgraded one year after a PSD issue compared to the credit rating of firms managed by rational CEOs. Again, this result is consistent with the hypothesis that following PSD issues, the performance of firms with optimistic CEOs is worse than the performance of firms with rational CEOs.

[16] To ensure that our performance measure is not affected by the loan issue, we calculate performance changes based on financial statements, which are issued after the respective loan issue.

[17] More than 75% of all PSD contracts are written on either the issuer's credit rating or the issuer's debt-to-EBITDA ratio.

[18] Using both PSD and straight debt contracts and interacting *Optimistic* with a PSD indicator variable yields very similar results.

Note that the results in Table 5 also rule out a possible alternative explanation of our results. Delaying the exercise of an in-the-money option can be a rational strategy if the manager possesses positive inside information. Therefore, being *optimistic* may capture positive inside information of a manager and not only irrational over-optimism. In this case, "optimistic" managers may issue PSD simply because they possess positive inside information about the firm's future performance. However, if this were the case, we would expect firm performance following a PSD issue to be better than that of rational managers on average. Our findings show that the opposite is the case.

4.4 Endogeneity

A potential concern with our analysis is that managerial optimism may be an endogenous choice by the firm's owners when selecting a CEO. The same factors that drive the choice of the CEO could in principle also determine the use of PSD. In order to address this problem we use a propensity score matching approach and estimate the probability that a firm is managed by an optimistic CEO. For example, Hirshleifer et al. (2012) argue that a reason for hiring optimistic CEOs might be that optimistic managers are more likely to invest in more innovative and riskier projects and can thereby benefit shareholders. We explicitly control for firm age in the first stage regression because innovations are more important in younger firms.[19] Furthermore, we use several firm characteristics, such as total assets, leverage, market-to-book, asset tangibility, interest coverage, profitability, current ratio, and industry-, year- and credit rating (notch level) fixed effects as additional explanatory variables. In untabulated results we find that firms with lower leverage ratios, higher market-to-book ratios, lower interest coverage ratios, and younger firms are more likely to be managed by optimistic CEOs. In the next step we match

[19] We compute firm age based on the data provided by Laura Field and Jay Ritter available on http://bear.warrington.ufl.edu/ritter/foundingdates.htm. The data is described in detail in Loughran and Ritter (2004). Firm founding dates are only available for roughly 50% of our sample, which leads to a sample reduction in Table 6.

firms based on the probability to be managed by an optimistic CEO, that is, we match one firm that is managed by an optimistic CEO to a firm that is predicted to be managed by an optimistic CEO but is indeed managed by a rational CEO.

[Table 6 here]

In Table 6 we report results of a logit regression specification as in Table 2 for the matched sample. We find that optimistic CEOs are 9-10% more likely to issue performance-sensitive debt contracts compared to rational CEOs. Thus, our results are even stronger after accounting for a possibly endogenous selection of optimistic CEOs.

A drawback of the propensity score matching technique is that the choice to hire an optimistic CEO can only be modeled based on observable firm characteristics. To control for unobservable time-invariant firm characteristics that might be correlated with the use of PSD and managerial optimism, we examine PSD issuance after CEO turnover.

In particular, we compare the use of PSD of incoming optimistic CEOs with the use of PSD of incoming rational CEOs three years before and three years after the turnover event.[20] We are forced to disregard the type of the outgoing CEOs due to data limitations. Conditioning our analysis on the type of outgoing CEO would render the sample size to be too small for statistical inference. Not conditioning on the type of the outgoing CEO, however, is conservative as it biases our tests against finding a statistically significant relationship.

We estimate two separate models with a dummy variable equal to one if the company issues a loan with a performance-pricing provision and zero

[20] The results are remain unaffected if we vary the event window and use, for example, five years before and after the turnover.

otherwise as dependent variable. The first column includes only observations where the incoming CEO is optimistic, the second column only observations where the incoming CEO is rational. Both regressions include the same control variables as in Table 2. To see whether optimistic CEOs pursue a different policy with respect to the use of PSD we estimate a difference-in-differences model. The first difference is calculated as the difference between the fraction of loans with a performance-pricing feature before and after the CEO turnover, represented by the coefficient *Post Turnover*. The second difference is the difference in the coefficient *Post Turnover* between optimistic and rational CEOs.

[Table 7 here]

Our results are presented in Table 7. We find that optimistic CEOs significantly increase the fraction of loans with a performance-pricing provision while rational CEOs seem to decrease the fraction of PSD (although not significantly). The difference between both coefficients is significantly different from zero suggesting that optimistic CEOs are more likely to issue PSD relative to rational CEOs even after controlling for unobservable, time-invariant firm effects.

5 Robustness

5.1 Other Optimism Measures

In this section, we analyze whether our results are robust to alternative methods to identify optimistic managers. In particular, we consider different moneyness thresholds for the original optimism classification, distinguish between Pre- and Post-Optimism, and consider alternative methods to identify optimism.

[Table 8 here]

Table 8 replicates Table 2 but uses alternative optimism measures. In Columns 1 and 2 we use more conservative moneyness thresholds than in our original optimism classification. In particular, we identify executives as optimistic if they ever hold an option until one year prior to expiration, which is at least 70% in-the-money (Column 1) or at least 100% in-the-money (Column 2). The original classification uses a moneyness threshold of 40%. The results in Table 8 confirm our previous findings. Firms managed by optimistic CEOs are significantly more likely to include a performance-pricing provision in their loan contracts than firms managed by rational CEOs. Thus, our results are not sensitive to the choice of the moneyness parameter, which is consistent with the robustness checks in Malmendier and Tate (2008).

Next, we follow Malmendier and Tate (2008) and distinguish between the time before and after an optimistic manager has ever shown evidence of being optimistic. The motivation for this separation is to justify the treatment of optimism as a time-invariant, personal characteristic. *Pre-Optimism* refers to the time period before the respective executive first holds an option that is at least 40% in-the-money until the final maturity year, and *Post-Optimism* refers to the time period thereafter. Table 8 shows that optimistic CEOs are significantly more likely to use PSD than rational CEOs, both before and after they are classified by our algorithm. This finding supports the notion that optimism is a time-invariant, personal characteristic.

In Column 4 we employ a different identification method of optimism, suggested by Malmendier and Tate (2005b). According to this method, CEOs are classified as optimistic if they hold stock options that are at least 67% in the money five years after the respective option grants. A CEO needs to show this behavior at least twice during his tenure to be classified as optimistic.

Malmendier and Tate (2005b) refer to this measure as *Holder 67*.[21] Using the *Holder 67* measure instead of the original optimism variable, our results are even stronger than before.

In Column 5, we use a new identification method of optimism first proposed by Sen and Tumarkin (2009). Instead of analyzing executives' option exercise behavior, this method examines the executives' stock holdings. An executive is classified as optimistic if his total stock holdings relative to his salary exceed the median stock holdings to salary ratio. The intuition for this classification is similar to the *Optimistic* classification. Executives are generally poorly diversified and have a large idiosyncratic risk exposure to their firms. Consequently, they should hold as little of their companies' stock as possible. If executives voluntarily hold more stock, they are likely to be overly optimistic with respect to the future performance of their firms. According to Core and Larcker (2002), many firms have a minimum stock holding requirement for their top executives in place, which often is stated in terms of multiples of the executives' salary. Like Sen and Tumarkin (2009) we use the median of this stock holdings-to-salary multiple as our threshold to distinguish between rational and optimistic executives. Again, the results in Table 8 confirm our previous findings that firms with optimistic CEOs are more likely to use performance-pricing provisions than firms managed by rational CEOs. In summary, our findings are robust to several alternative optimism specifications.

5.2 CEO Characteristics

Bertrand and Schoar (2003) show that managerial style, which is likely to be affected by manager characteristics such as age, gender or educational background, significantly affects corporate financial policy. For example, Beber and Fabbri (2012) find that CEO age and education is correlated with speculation in the FX market. Huang and Kisgen (2013) find that male exec-

[21] We are grateful to Rik Sen for providing us with this measure.

utives make riskier financial and investment decisions than female executives. Kaplan, Klebanov, and Sorensen (2012) find that general CEO ability and execution skills matter in buyout and venture capital transactions. To address the concern that our optimism measure may be correlated with CEO characteristics that also affect risk-taking and therefore the decision to issue PSD, we explicitly control for CEO age, tenure, gender, and education in this section.

In addition to personal managerial characteristics, executive compensation plans are likely to also affect risk-taking behavior. In the context of PSD, Tchistyi et al. (2011) document that managers whose compensation is more sensitive to stock return volatility choose riskier pricing grids. To rule out the possibility that our results are driven by a correlation between the optimism measures and the delta/vega of the CEOs stock option portfolio, we explicitly control our analysis for these sensitivities. We follow Core and Guay (2002) in calculating delta and vega. The results are reported in Table 9.

[Table 9 here]

The only variable that is significantly correlated with the decision to issue PSD is optimism. The other personal characteristics, as well as the delta and the vega of the CEO's stock and option portfolio are not significantly related to the decision to issue PSD. As noted above, controlling for delta and vega mitigates concerns that our optimism measure is positively correlated with a larger general risk preference by those executives.

6 Conclusion

This paper explores the impact of managerial optimism on debt contract design. In particular, we investigate whether optimistic CEOs, given their overly optimistic views about their firms' future performance, are more likely to issue performance-sensitive debt (PSD) than rational managers. This

possibility arises because optimistic managers overestimate the value of the option implicit in the performance-pricing provision. Thus, optimistic managers perceive PSD as a relatively cheap form of financing.

We find that optimistic managers are indeed more likely to issue PSD than rational managers. We further find that within the subset of PSD-issuing firms, optimistic managers choose contracts with higher performance-pricing sensitivities, i.e., pricing grids with more coupon rate increase potential in response to performance deterioration. Finally, we find that firms managed by optimistic managers perform worse after a PSD issue compared to firms managed by rational managers. This result confirms our assumption that optimistic managers have more biased views regarding their future performance relative to rational managers and do not possess some information advantage. Our results are robust to the endogenous selection of an optimistic CEO as well as several measures of managerial optimism. Overall, our results indicate that managerial optimism can have a significant impact on debt contract design in the market for syndicated loans.

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Appendix

A.1 Figures

Figure 1: PSD Pricing Grid Example

This figure shows the spread over LIBOR IBM paid on a syndicated loan contract negotiated in March 2004. IBM's senior credit rating at the time of the loan issue was A+, the initial interest rate LIBOR + 12bp. Source: Dealscan.

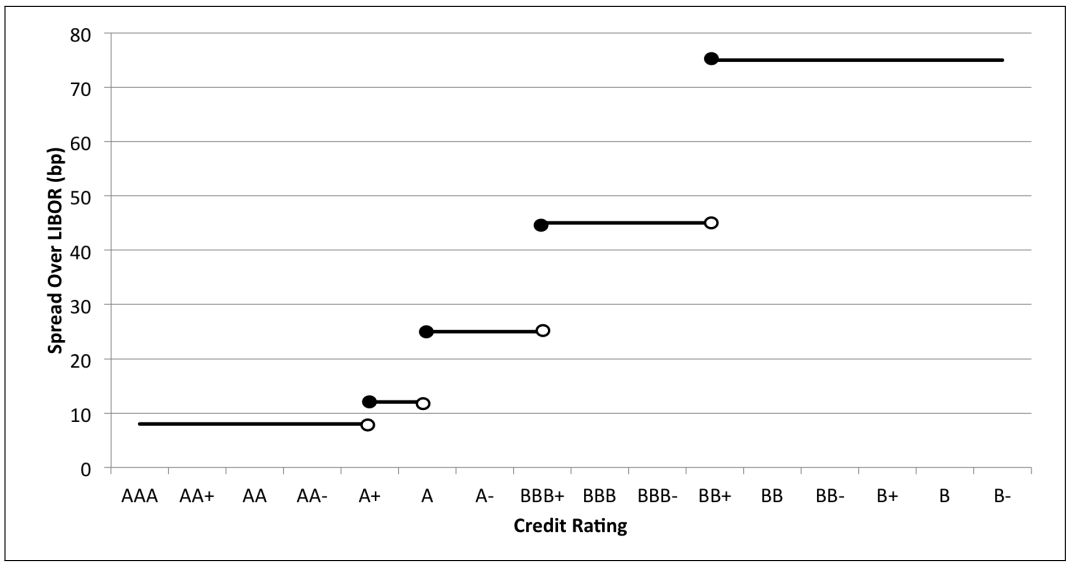


Figure 2: PSD Pricing Grids - Optimistic vs. Rational CEOs

This figure shows the average pricing grids for firms with optimistic CEOs (straight line) and rational CEOs (dashed line). The relative spread at each rating notch is calculated as the actual spread at that rating notch divided by the spread paid if the issuers credit rating is AAA.

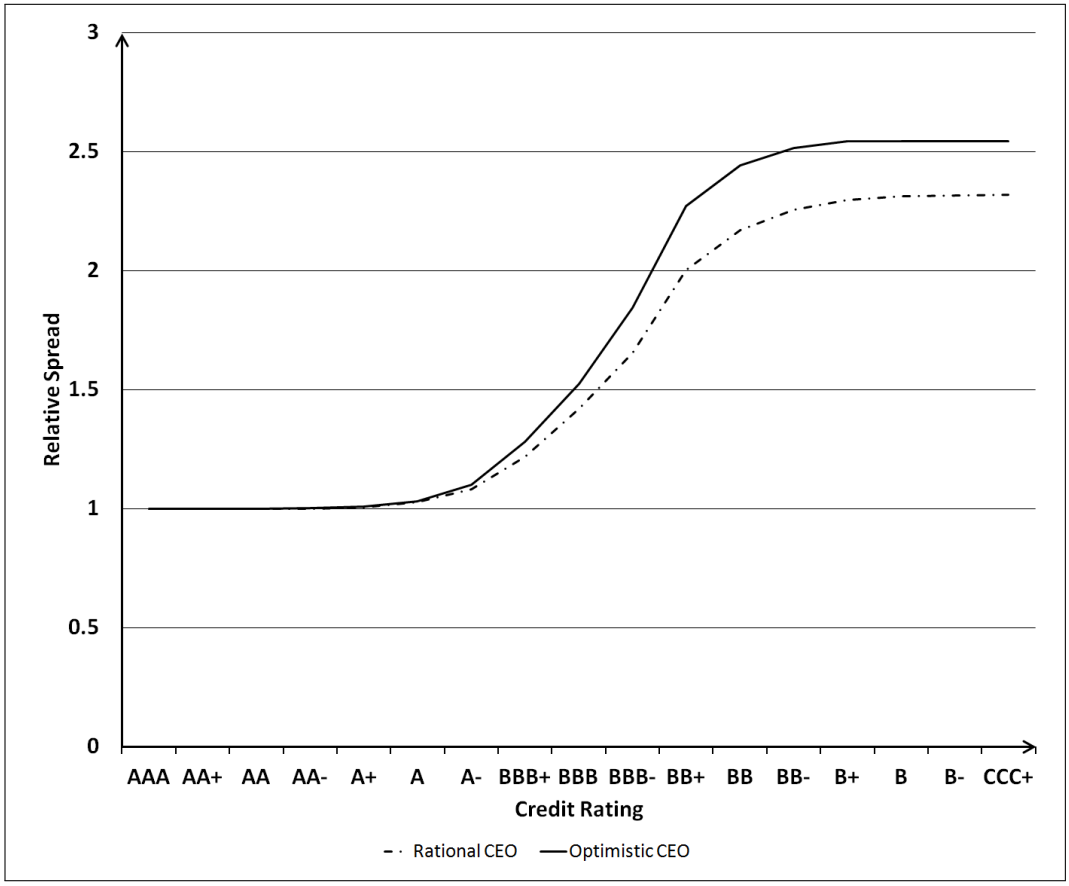


Figure 3: Slope of the PSD Pricing Grid

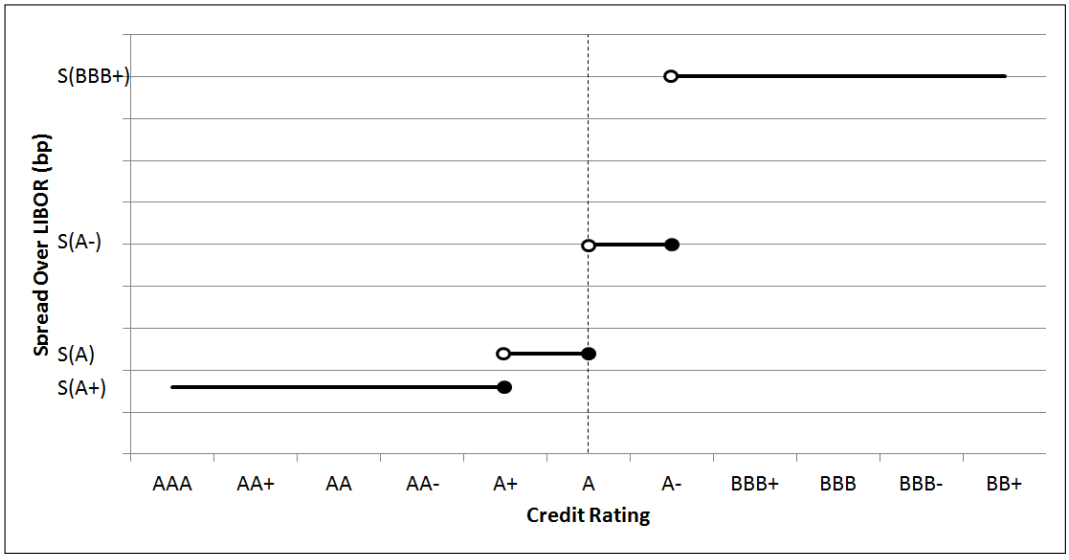
This figure shows a hypothetical rating-based performance pricing grid. The rating at the time of loan origination is assumed to be A-. The local Slope measures the pricing grid slope around the initial rating, and is defined as follows:

$$\text{Local Slope} = 0.5 * \left(\frac{S_{A-} - S_A}{Bond_{A-} - Bond_A} + \frac{S_A - S_{A+}}{Bond_A - Bond_{A+}} \right)$$

S_i is the spread at rating notch i, $Bond_i$ is the level of the bond market index for rating notch i. Local Slope $\uparrow$ and Local Slope $\downarrow$ measure the local slopes for rating increases and rating decreases respectively. The average slope measures the overall slope of the pricing grid, and is defined as follows:

$$\text{Average Slope} = \frac{1}{3} * \left(\frac{S_A - S_{A+}}{Bond_A - Bond_{A+}} + \frac{S_{A-} - S_A}{Bond_{A-} - Bond_A} + \frac{S_{BBB+} - S_{A-}}{Bond_{BBB+} - Bond_{A-}} \right)$$

We also define the average slopes for rating increases and rating decreases according to the local slope definitions. The slope of straight debt is equal to zero.



A.2 Tables

Table 1: Descriptive Statistics: Rational vs. Optimistic CEOs

This table reports descriptive statistics of loan and borrower characteristics of syndicated loans and non-syndicated loans reported by Dealscan between 1992-2010. The sample is divided into firms with rational and optimistic CEOs. All variables are defined in the Appendix.

	Rational CEOs				**Optimistic CEOs**			
	Mean	Median	Std. Dev	Obs.	Mean	Median	Std. Dev	Obs.
Panel A: Borrower Characteristics								
Total Assets (million USD)	7,452.15	2,224.88	14,060.66	4,500	6,501.62	2,135.63	13,205.37	2,434
Leverage	0.27	0.26	0.19	4,500	0.25	0.24	0.16	2,434
Market-To-Book	1.78	1.48	0.95	4,500	1.87	1.60	0.95	2,434
Tangibility	0.35	0.29	0.23	4,500	0.33	0.26	0.24	2,434
Interest Coverage	22.11	7.10	52.11	4,500	22.42	9.19	49.37	2,434
Profitability	0.18	0.15	0.15	4,500	0.17	0.14	0.13	2,434
Current Ratio	1.75	1.50	1.05	4,500	1.77	1.57	0.99	2,434
Rating: AA or better (0/1)	0.01	0.00	0.12	4,500	0.03	0.00	0.16	2,434
Rating: Betw. AA- and A- (0/1)	0.17	0.00	0.38	4,500	0.18	0.00	0.39	2,434
Rating: Betw. BBB+ and BB- (0/1)	0.42	0.00	0.49	4,500	0.43	0.00	0.50	2,434
Rating: B+ or worse (0/1)	0.07	0.00	0.26	4,500	0.05	0.00	0.21	2,434
No Rating (0/1)	0.31	0.00	0.46	4,500	0.31	0.00	0.46	2,434
Panel B.1: General Loan Characteristics								
Facility Amount (million USD)	537.39	250.00	987.89	4,500	539.44	250.00	1,021.55	2,434
Maturity (months)	44.16	50.00	23.08	4,500	43.99	55.00	22.58	2,434
Multiple Tranches (0/1)	0.42	0.00	0.49	4,500	0.44	0.00	0.50	2,434
Secured (0/1)	0.37	0.00	0.48	4,500	0.33	0.00	0.47	2,434
PSD (0/1)	0.53	1.00	0.50	4,500	0.57	1.00	0.49	2,434
Panel B.2: PSD Characteristics								
PSD(Rating) (0/1)	0.43	0.00	0.50	2,367	0.44	0.00	0.51	1,397
PSD(Accounting) (0/1)	0.58	1.00	0.49	2,367	0.57	1.00	0.50	1,397
PSD(Increasing) (0/1)	0.12	0.00	0.33	2,367	0.14	0.00	0.35	1,397
PSD(Mixed) (0/1)	0.67	1.00	0.47	2,367	0.65	1.00	0.48	1,397
PSD(Decreasing) (0/1)	0.19	0.00	0.39	2,367	0.18	0.00	0.39	1,397
# Pricing Steps	4.73	5.00	1.30	2,367	4.71	5.00	1.31	1,397

Table 2: Performance-Sensitive vs. Straight Debt

This table reports the marginal effects of logit regressions. The dependent variable equals one if a loan includes a performance pricing provision and zero otherwise. The main variable of interest is *Optimistic*, which is an indicator variable that equals one if the CEO of the borrower is classified as optimistic and zero otherwise. The independent variables are defined in the Appendix. The regressions include year, industry (two-digit SIC), rating (rating notch level), deal purpose (corporate, debt repayment, acquisition, working capital, commercial paper backup, or other), and loan type (term loan, revolver, bridge loan, or 365-day facility) dummies when indicated. Marginal effects for each covariate are calculated as the difference in predicted probabilities for a particular outcome computed at their mean values holding all other covariates constant. For factor levels it is computed as a discrete change from the base level. Standard errors are heteroskedasticity robust and clustered at the firm level to account for non-independent observations within firms. *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	(1)	(2)	(3)	(4)
Panel A: Optimism Classification				
Optimistic (0/1)	0.052**	0.059***	0.061**	0.055**
	(0.024)	(0.023)	(0.024)	(0.025)
Panel B: Borrower Characteristics				
ln(Total Assets)	−0.109***	−0.103***	−0.078***	−0.090***
	(0.012)	(0.013)	(0.014)	(0.015)
Leverage	−0.231***	−0.143**	−0.097	−0.082
	(0.074)	(0.072)	(0.072)	(0.082)
Market-to-Book	−0.021*	−0.004	0.001	0.001
	(0.012)	(0.012)	(0.013)	(0.013)
Tangibility	−0.034	−0.007	−0.049	−0.071
	(0.079)	(0.077)	(0.080)	(0.083)
Interest Coverage	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Profitability	0.045	0.008	0.028	0.026
	(0.091)	(0.090)	(0.092)	(0.096)
Current Ratio	−0.012	−0.011	−0.010	−0.020
	(0.013)	(0.013)	(0.013)	(0.014)
Panel C: Loan Characteristics				
ln(Facility Amount)	0.139***	0.145***	0.125***	0.114***
	(0.011)	(0.011)	(0.011)	(0.012)
ln(Maturity)	0.107***	0.102***	0.101***	0.095***
	(0.013)	(0.013)	(0.021)	(0.021)
Multiple Tranches (0/1)	0.022	0.027	0.071***	0.067***
	(0.018)	(0.018)	(0.019)	(0.020)
Secured (0/1)	0.086***	0.139***	0.134***	0.164***
	(0.022)	(0.023)	(0.023)	(0.024)
Year Fixed Effects	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes
Credit Rating Fixed Effects	No	Yes	Yes	Yes
Deal Purpose Fixed Effects	No	No	Yes	Yes
Loan Type Fixed Effects	No	No	Yes	Yes
Bank Fixed Effects	No	No	No	Yes
Observations	6,705	6,703	6,703	6,538
Pseudo R^2	0.107	0.138	0.184	0.212

Table 3: Interest Increasing vs. Interest Decreasing PSD

This table reports the marginal effects of a multinominal logit regression. The dependent variable equals one for PSD contracts that contain mainly spread increase features (Column 1), two for PSD contracts that contain both spread increase and spread decrease features (Column 2), three for PSD contracts that contain mainly spread decrease features (Column 3) and zero for non-PSD contracts (base group). The independent variables are the same as the ones used in Table 2 and are defined in the Appendix. The regressions include year, industry (two-digit SIC), rating (rating notch level), deal purpose (corporate, debt repayment, acquisition, working capital, commercial paper backup, or other), and loan type (term loan, revolver, bridge loan, or 365-day facility) dummies when indicated. Marginal effects for each covariate are computed as the difference in predicted probabilities for a particular outcome computed at their mean values holding all other covariates constant. For factor levels it is computed as a discrete change from the base level. Standard errors are heteroskedasticity robust and clustered at the firm level to account for non-independent observations within firms. *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	(1) PSD (Increasing)	(2) PSD (Mixed)	(3) PSD (Decreasing)
Optimistic (0/1)	0.015**	0.003	0.001
	(0.006)	(0.004)	(0.001)
Firm Characteristics	Yes		
Loan Characteristics	Yes		
Year Fixed Effects	Yes		
Industry Fixed Effects	Yes		
Credit Rating Fixed Effects	Yes		
Deal Purpose Fixed Effects	Yes		
Loan Type Fixed Effects	Yes		
Bank Fixed Effects	Yes		
Observations	6,718		
Pseudo R^2	0.253		

Table 4: Managerial Optimism and the Slope of PSD Contracts

This table reports OLS regressions of the slopes of the performance pricing grids on CEO, borrower and loan characteristics. The dependent variables are the various slope measures defined in Figure 3. The independent variables are the same as in Table 2 and are defined in the Appendix. The regressions include year, industry (two-digit SIC), rating (rating notch level), deal purpose (corporate, debt repayment, acquisition, working capital, commercial paper backup, or other), and loan type (term loan, revolver, bridge loan, or 365-day facility) dummies when indicated. The sample includes straight debt contracts and rating-based PSD contracts. Standard errors are heteroskedasticity robust and clustered at the firm level to account for non-independent observations within firms. *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

Panel A: Local Slopes

	(1) Local Slope	(2) Local Slope ↑	(3) Local Slope ↓
Optimistic (0/1)	0.013*	0.004	0.018**
	(0.007)	(0.006)	(0.007)
Borrower Characteristics	Yes	Yes	Yes
Loan Characteristics	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes
Credit Rating Fixed Effects	Yes	Yes	Yes
Deal Purpose Fixed Effects	Yes	Yes	Yes
Loan Type Fixed Effects	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes
Observations	4,502	4,365	4,428
Adj. R^2	0.254	0.223	0.237

Panel B: Average Slopes

	(4) Average Slope	(5) Average Slope ↑	(6) Average Slope ↓
Optimistic (0/1)	0.011	0.007	0.013*
	(0.007)	(0.006)	(0.007)
Borrower Characteristics	Yes	Yes	Yes
Loan Characteristics	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes
Credit Rating Fixed Effects	Yes	Yes	Yes
Deal Purpose Fixed Effects	Yes	Yes	Yes
Loan Type Fixed Effects	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes
Observations	4,502	4,366	4,430
Adj. R^2	0.257	0.252	0.234

Table 5: Post-PSD-Issue Performance

In columns (1) and (2), this table reports OLS regressions of the change in a firm's Debt-to-EBITDA ratio k years after a PSD issue *(k = 1,2)*. In columns (3) and (4), the table reports marginal effects of logit regressions. The dependent variable equals one if the borrowing firm was downgraded k years after a PSD issue and zero otherwise. The independent variables are the same as the ones used in Table 2 and are defined in the Appendix. The regressions include year, industry (two-digit SIC), rating (rating notch level), deal purpose (corporate , debt repayment, acquisition, working capital, commercial paper backup, or other), and loan type (term loan, revolver, bridge loan, or 365-day facility) dummies when indicated. In all regressions, the sample is restricted to PSD contracts with a spread-increase potential. Marginal effects of each covariate are computed as the difference in predicted probabilities for a particular outcome computed at their mean values holding all other covariates constant. For factor levels it is computed as a discrete change from the base level. The regressions furthermore include all control variables used in Table 2. Standard errors are heteroskedasticity robust and clustered at the firm level to account for non-independent observations within firms. *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively. The regressions include time, rating (notch level), and industry fixed effects, as well as loan, and borrower characteristics. All variables are defined in Table 10

	(1)	(2)	(3)	(4)
	Δ Debt-to-EBITDA		Rating Downgrade	
	$k = 1$	$k = 2$	$k = 1$	$k = 2$
Optimistic (0/1)	0.400**	0.354*	0.048*	0.021
	(0.156)	(0.183)	(0.026)	(0.043)
Firm Char.	Yes	Yes	Yes	Yes
Loan Char.	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes
Credit Rating Fixed Effects	Yes	Yes	Yes	Yes
Deal Purpose Fixed Effects	Yes	Yes	Yes	Yes
Loan Type Fixed Effects	Yes	Yes	Yes	Yes
Observations	2,341	2,193	934	906
Adjusted R^2	0.034	0.048		
Pseudo R^2			0.123	0.062

Table 6: Propensity Score Matching - PSD vs. Straight Debt

This table reports the marginal effects for the second stage of a propensity score matching model. The dependent variable equals one if a loan includes a performance-pricing provision and zero otherwise. The independent variables are the same as in Table 2 and are defined in the Appendix. The regressions include year, industry (two-digit SIC), rating (rating notch level), deal purpose (corporate, debt repayment, acquisition, working capital, commercial paper backup, or other), and loan type (term loan, revolver, bridge loan, or 365-day facility) dummies when indicated. The propensity scores are estimated in the first stage by a probit regression using a dummy as the dependent variable that equals one if the firm is managed by an optimistic CEO and zero otherwise. Marginal effects for each covariate are computed as the difference in predicted probabilities for a particular outcome computed at their mean values holding all other covariates constant. For factor levels it is computed as a discrete change from the base level. Standard errors are heteroskedasticity robust and clustered at the firm level to account for non-independent observations within firms. *, **, *** indicate statistical significance at the 10%, 5% and 1% level respectively.

	(1) PSD(0/1)	(2) PSD(0/1)
Optimistic (0/1)	0.094***	0.088**
	(0.036)	(0.039)
Borrower Characteristics	Yes	Yes
Loan Characteristics	Yes	Yes
Year Fixed Effects	Yes	Yes
Industry Fixed Effects	Yes	Yes
Credit Rating Fixed Effects	Yes	Yes
Deal Purpose Fixed Effects	Yes	Yes
Loan Type Fixed Effects	Yes	Yes
Bank Fixed Effects	No	Yes
Observations	1,544	1,544
Pseudo R^2	0.245	0.297

Table 7: CEO Turnover - PSD vs. Straight Debt

This table reports estimation results of fixed effects linear probability models. The dependent variable equals one if a loan includes a performance pricing provision and zero otherwise. The independent variables are the same as in Table 2 and are defined in the Appendix. The regressions include year, industry (two-digit SIC), rating (rating notch level), deal purpose (corporate, debt repayment, acquisition, working capital, commercial paper backup, or other), and loan type (term loan, revolver, bridge loan, or 365-day facility) dummies when indicated. The sample only includes loans issued during the three years before and after a CEO turnover and loans of firms where the new CEO can be classified as either optimistic or rational. In total, there are 161 CEO turnover events. *Post Turnover* is an indicator variable which equals one if the loan was issued in the three years following a CEO turnover. In model (1), the sample is restricted to events where the incoming CEO was classified as optimistic. In model (2), the sample is restricted to events where the incoming CEO was classified as rational. *, **, *** indicate statistical significance at the 10%, 5% and 1% level respectively.

	(1) PSD(0/1)	(2) PSD(0/1)
Post Turnover (0/1)	0.274*	−0.082
	(0.151)	(0.084)
Borrower Characteristics	Yes	Yes
Loan Characteristics	Yes	Yes
Year Fixed Effects	Yes	Yes
Credit Rating Fixed Effects	Yes	Yes
Firm Fixed Effects	Yes	Yes
Deal Purpose Fixed Effects	Yes	Yes
Loan Type Fixed Effects	Yes	Yes
Bank Fixed Effects	Yes	Yes
Observations	236	620
Adj. R^2	0.656	0.521

Test if coefficients are equal in both models:

Post Turnover (Optimistic) = Post Turnover (Rational)

$\chi^2(1) = 7.04$

Prob $> \chi^2 = 0.0080$***

Table 8: Alternative Optimism Classifications

This table reports the marginal effects of logit regressions. The dependent variable equals one if a loan includes a performance pricing provision and zero otherwise. *Optimism 70* and *Optimism 100* are indicator variables that equal one if the CEO of the borrower is classified as optimistic, i.e. if the CEO ever held an option until the final maturity year, which is at least 60 or 100% in the money and zero otherwise. *Holder67* is an indicator variable that is equal to one if CEOs did not exercise options that were at least 67% in the money in their fifth year at least twice during their tenure. *Pre-Optimistic* and *Post-Optimistic* indicate the time period before an executive ever held an option until the final maturity year, which is at least 40% in the money and the time period after this activity, respectively. Voluntary Holder is an indicator variable that equals one if CEOs voluntarily holds more stocks of their company than required by company constitutions. The other independent variables are the same as the ones used in Table 2 and are defined in the Appendix. The regressions include year, industry (two-digit SIC), rating (rating notch level), deal purpose (corporate, debt repayment, acquisition, working capital, commercial paper backup, or other), and loan type (term loan, revolver, bridge loan, or 365-day facility) dummies when indicated. Marginal effects for each covariate are constructed as the difference in predicted probabilities for a particular outcome computed at their mean values holding all other covariates constant. For factor levels it is computed as a discrete change from the base level. Standard errors are heteroskedasticity robust and clustered at the firm level to account for non-independent observations within firms. *, **, *** indicate statistical significance at the 10%, 5% and 1% level respectively.

	(1) PSD (0/1)	(2) PSD (0/1)	(3) PSD (0/1)	(4) PSD (0/1)	(5) PSD (0/1)
Optimistic (60) (0/1)	0.044*				
	(0.026)				
Optimistic (100) (0/1)		0.048*			
		(0.027)			
Pre-Optimistic (0/1)			0.055*		
			(0.031)		
Post-Optimistic (0/1)			0.054*		
			(0.029)		
Holder 67 (0/1)				0.094***	
				(0.029)	
Voluntary Holder (0/1)					0.062**
					(0.026)
Borrower Characteristics	Yes	Yes	Yes	Yes	Yes
Loan Characteristics	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes
Credit Rating Fixed Effects	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes
Deal Purpose Fixed Effects	Yes	Yes	Yes	Yes	Yes
Loan Type Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	6,538	6,538	6,538	3,273	6,259
Pseudo R^2	0.211	0.211	0.212	0.236	0.205

Table 9: CEO Characteristics

This table reports the marginal effects of logit regressions. The dependent variable equals one if a loan includes a performance pricing provision and zero otherwise. *Female* is a dummy variable that is equal to one if the CEO is female. *Ph.D.* is a dummy variable if the CEO holds a Ph.D. degree. *Tenure* is the time in days since the executive became CEO. *Delta* measures the sensitivity of the CEO's overall option and stock portfolio to price movements of the company's stock. *Vega* measures the sensitivity of the CEO's overall option and stock portfolio to volatility changes of the company's stock. The other independent variables are the same as the ones used in Table 2 and are defined in the Appendix. The regressions include year, industry (two-digit SIC), rating (rating notch level), deal purpose (corporate, debt repayment, acquisition, working capital, commercial paper backup, or other), and loan type (term loan, revolver, bridge loan, or 365-day facility) dummies when indicated. Marginal effects for each covariate are constructed as the difference in predicted probabilities for a particular outcome computed at their mean values holding all other covariates constant. For factor levels it is computed as a discrete change from the base level. Standard errors are heteroskedasticity robust and clustered at the firm level to account for non-independent observations within firms. *, **, *** indicate statistical significance at the 10%, 5% and 1% level respectively.

	(1) PSD (0/1)	(2) PSD (0/1)	(3) PSD (0/1)
Optimistic (0/1)	0.056**	0.061**	0.059**
	(0.026)	(0.026)	(0.026)
Female (0/1)	0.011		−0.011
	(0.084)		(0.089)
Ph.D. (0/1)	−0.045		−0.070
	(0.059)		(0.059)
Ln(Age)	−0.132		−0.125
	(0.089)		(0.094)
Tenure	0.002		0.003
	(0.002)		(0.002)
Delta		−0.112	−0.203
		(0.309)	(0.322)
Vega		−0.004	−0.004
		(0.005)	(0.005)
Borrower Characteristics	Yes	Yes	Yes
Loan Characteristics	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes
Credit Rating Fixed Effects	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes
Deal Purpose Fixed Effects	Yes	Yes	Yes
Loan Type Fixed Effects	Yes	Yes	Yes
Observations	6,407	5,985	5,859
Pseudo R^2	0.215	0.211	0.211

Table 10: Variable Definitions

Variable Name	Definition
Managerial Characteristics:	
Optimistic (0/1)	A dummy variable which equals one if a manager holds executive stock options until the last year of maturity that are at least 40% in-the-money and zero otherwise.
Optimistic (60) (0/1)	A dummy variable which equals one if a manager holds executive stock options until the last year of maturity that are at least 60% in-the-money and zero otherwise.
Optimistic (100) (0/1)	A dummy variable which equals one if a manager holds executive stock options until the last year of maturity that are at least 100% in-the-money and zero otherwise.
Pre-Optimistic (0/1)	A dummy variable which equals one in the time period before a manager ever held an option until the final maturity year, which is at least 40% in the money and zero otherwise.
Post-Optimistic (0/1)	A dummy variable which equals one in the time period after a manager ever held an option until the final maturity year, which is at least 40% in the money and zero otherwise.
Holder67 (0/1)	A dummy variable which equals one if a manager holds options five years after the option grant that are at least 67% in-the-money. This behavior has to be shown at least twice by the manager.
Voluntary Holder (0/1)	A dummy variable, which equals one if $\frac{Stock\ Holdings}{Salary} >= Median(\frac{Stock\ Holdings}{Salary})$ and zero otherwise, where: Stock holdings is the value of company stock held by the CEO in $million. Salary is the CEO salary in $million.
Delta	Overall delta of the option and stock portfolio held by the CEO divided by total shares outstanding. The individual stock delta is one per definition, the delta of an individual option is defined as $e^{-dT}N(Z)$.
Vega	$e^{-dT}N^{'}(Z)ST^{1/2} * (0.01)$. In our regressions we use $log(1 + vega)$ to correct for the skewness of vega.

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Variable Name	Definition
	where:
	$Z = \left[ln\left(S/X\right) + T\left(r - d + \sigma^2/2\right)\right]/\sigma T^{1/2}$
	N = cumulative probability function for the normal distribution
	$N^{'}$ =normal density function.
	S = price of the underlying stock
	X = exercise price of the option
	σ = expected stock-return volatility over the life of the option
	r = natural logarithm of the risk-free rate
	T = time to maturity of the option in years
	d = natural logarithm of expected dividend yield over the life of the option
Female (0/1)	A dummy variable, which equals one if the CEO is female.
Ph.D. (0/1)	A dummy variable, which equals one if the CEO holds a Ph.D. degree.
Age	Age of the CEO in years at the time of the debt issue.
Tenure	Time in days since the executive became CEO.
Borrower/Issuer characteristics:	
Total Assets	Firm's total assets in $million.
Leverage	Long-term debt divided by total assets.
Market-to-Book	Market value of the firm divided by the book value of assets.
Tangibility	Net property plant and equipment divided by total assets.
Interest Coverage	Interest expenses divided by EBITDA.
Profitability	EBITDA divided by total assets.
Current Ratio	Current assets divided by current liabilities.
Debt-to-EBITDA	Total debt divided by EBITDA.
No Rating (0/1)	A dummy variable, which equals one if the borrower was not rated by S&P at the time of the debt issue.
AA or better (0/1)	A dummy variable, which equals one if the borrower was rated better than AA- by S&P at the time of the debt issue.

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Variable Name	**Definition**
Betw. AA- and A- (0/1)	A dummy variable, which equals one if the borrower was rated between AA- and A- by S&P at the time of the debt issue.
Betw. BBB+ and BB- (0/1)	A dummy variable, which equals one if the borrower was rated between BBB+ and BB- by S&P at the time of the debt issue.
B+ or worse (0/1)	A dummy variable, which equals one if the borrower was rated worse than BB- by S&P at the time of the debt issue.
Rating Downgrade (0/1)	A dummy variable, which equals one if the borrowing firm was downgraded k years after a PSD issue and zero otherwise.
Loan characteristics:	
Facility Amount	Overall facility volume in $million.
Maturity	Time to maturity in months.
Multiple Tranches (0/1)	A dummy that equals one if the deal consists of more than one tranche and zero otherwise.
Secured (0/1)	A dummy variable, which equals one if the loan contains collateral
Post Turnover (0/1)	An indicator variable which equals one if the loan was issued in the three years following a CEO turnover.
PSD grid characteristics:	
PSD (0/1)	A dummy variable, which equals one if the loan contract includes a performance pricing provision and zero otherwise.
PSD(Rating) (0/1)	A dummy variable, which equals one if the loan contract includes a performance pricing provision based on the issuer's credit rating and zero otherwise.
PSD(Accounting) (0/1)	A dummy variable, which equals one if the loan contract includes a performance pricing provision based on an accounting ratio and zero otherwise.
PSD(Increasing) (0/1)	A dummy variable, which equals one if $\frac{S_i - S_{Min}}{S_{Max} - S_{Min}} < \frac{1}{3}$ and zero otherwise.

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Variable Name	**Definition**
PSD(Mixed) (0/1)	A dummy variable, which equals one if $\frac{1}{3} >= \frac{S_i - S_{Min}}{S_{Max} - S_{Min}} < \frac{2}{3}$ and zero otherwise.
PSD(Decreasing) (0/1)	A dummy variable, which equals one if $\frac{S_i - S_{Min}}{S_{Max} - S_{Min}} >= \frac{2}{3}$ and zero otherwise.
# Pricing Steps	Number of pricing steps defined in the pricing grid.
Local Slope	$0.5 * \left(\frac{S_{i+1} - S_i}{Bond_{i+1} - Bond_i} + \frac{S_i - S_{i-1}}{Bond_i - Bond_{i-1}} \right)$
Local Slope ↑	$\frac{S_i - S_{i+1}}{Bond_i - Bond_{i+1}}$
Local Slope ↓	$\frac{S_{i-1} - S_i}{Bond_{i-1} - Bond_i}$
	where:
	i is the borrower's long-term credit rating as of contract inception
	$i+1$ is the borrower's long-term credit rating as of contract inception plus one notch (upgrade)
	$i-1$ is the borrower's long-term credit rating as of contract inception minus one notch (downgrade)
	S_i is the spread that the borrower has to pay given rating i
	S_{i+1} is the spread that the borrower has to pay given rating $i+1$
	S_{i-1} is the spread that the borrower has to pay given rating $i-1$
	S_{Min} is the lowest spread defined in the pricing grid
	S_{Max} is the highest spread defined in the pricing grid
	Bond refers to the market spread for the respective rating notch
Average Slope	Calculated as Local Slope but over all rating notches defined in the pricing grid.
Average Slope ↑	Calculated as Local Slope ↑, but over all credit ratings above the firm's rating at the time of contract inception.
Average Slope ↓	Calculated as Local Slope ↓, but over all credit ratings below the firm's rating at the time of contract inception.

Managerial Optimism and Corporate Speculation

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Abstract:

Overconfident individuals overestimate their abilities and the precision of their information signals and are therefore more likely to speculate on perceived mispricings in financial markets. Using detailed data on derivative positions of firms in the gold mining industry between 1992 and 2011, this paper shows that CFO overconfidence is positively related to corporate speculation. We also find that speculation is associated with higher speculative losses, especially for firms with overconfident CFOs. In contrast, CEO overconfidence does not seem to affect a firm's use of derivatives for speculation.

Keywords: Behavioral Corporate Finance; Overconfidence; Risk Management; Hedging; Corporate Speculation

JEL-Classification: G02, G14, G32, G39

1 Introduction

Several studies have documented evidence, which is consistent with firms using derivatives at least partly for speculative purposes. For example, Géczy, Minton, and Schrand (2007) find that 40% of surveyed firms use derivatives to speculate "at least sometimes". Dolde (1993) reports that a large fraction of surveyed firms state that the amount of hedging depends on the view of future market movements. Although corporate speculation with derivatives appears widespread, firms are not very successful at doing so: Brown, Crabb, and Haushalter (2006) and Adam and Fernando (2006) report that the economic gains from corporate speculation are small at best and that speculation does not appear to generate value on average. These findings raise the question, why firms speculate if it is not profitable to do so? Do behavioral biases, such as managerial overconfidence, perhaps play a role in a firm's decision to trade with derivatives? For example, Odean (1998) shows that overconfidence induces trading because overconfident individuals overestimate the precision of their information signals.

We investigate these questions by examining the quarterly derivatives holdings of all public North American gold mining firms between 1992 and 2011. We focus on this industry because it provides, to the best of our knowledge, the most detailed data about firms' financial derivatives positions, which enables us to define a measure of excessive derivatives trading, and a measure of the gains/losses, which accrue solely from a firm's derivatives transactions. We complement this data with compensation data from Execucomp and proxy statements to classify managers as overconfident following the methodology proposed by Malmendier and Tate (2005a). According to their definition a manager is overconfident if he or she ever held an option until maturity, which

was at least 40% in-the-money the year-end prior to maturity. This definition has been used by several studies.[1]

We confirm the findings of Adam and Fernando (2006) that there appears to be significant amount of excessive trading with derivatives, and that this excessive trading produces only marginally positive cash flows on average. Our first new result is that we find a positive correlation between the extent of corporate speculation and managerial overconfidence. Among the firms that use gold derivatives, firms with an overconfident CFO have significantly higher variation in their hedge ratios. In particular, the coefficient of variation is about 0.25 higher in firms with overconfident CFOs, which is economically significant given an overall mean of about 0.6. Furthermore, we find a negative relation between the extent of speculation and the gains from speculation. Firms that speculate more realize larger losses. Corporate speculation generates even larger losses if the CFO is overconfident than if the CFO is rational.[2] We also test whether CEO overconfidence has an effect on corporate speculation, but do not find any significant relation. This is consistent with the CFO rather than the CEO being responsible for the execution of a firm's derivative strategies (Bodnar, Giambona, Graham, and Harvey (2014)). All results are robust to the chosen overconfidence classification, various measures of speculation, and to the inclusion of other manager characteristics such as age or education.

The decision to select an overconfident manager might be endogenous. We address this issue by using a propensity score matching technique and match firms that are likely to be managed by a non-overconfident manager but are indeed managed by an overconfident manager to similar firms managed by

[1] See, for example, Malmendier and Tate (2008), Malmendier, Tate, and Yan (2011), or Deshmukh, Goel, and Howe (2013).

[2] In terms of economic significance, firms with overconfident CFOs realize higher speculative losses of approximately nine dollars per derivative contract relative to firms with rational CFOs. This is significant given an overall mean of speculative cash flow of about seven dollars per contract.

non-overconfident managers. Our results remain unaffected after accounting for a potential endogenous selection.

We make two major contributions to the existing literature. First, we extend the literature on corporate speculation. Stulz (1996) argues that firms have an incentive to speculate if (i) they have superior information and if their financial situation allows them to take on additional risks, or (ii) if they are close to bankruptcy. Brown et al. (2006) and Adam and Fernando (2006) find evidence for a substantial amount of speculation by gold mining companies but only small profits resulting from speculation. Géczy et al. (2007) use survey data and report that 40% of sample firms sometimes "take a view" when using derivatives. Faulkender (2005) and Chernenko and Faulkender (2011) show that interest rate derivative usage is primarily driven by speculative objects. Finally, Beber and Fabbri (2012) show that individual characteristics of managers such as age, MBA or work experience are related to corporate speculation. We add to this literature by showing that managerial overconfidence can have a significant impact on a firm's tendency to speculate. Firms with overconfident CFOs are more likely to bet on market movements and can suffer significant losses resulting from speculation. This finding complements the literature on the effect of managerial overconfidence on corporate financial policies. For example, Malmendier and Tate (2005a) show that overconfident managers prefer to fund investment projects internally, while Adam, Burg, Scheinert, and Streitz (2014) show that overconfident managers prefer debt contracts with performance pricing provisions and fare worse with these contracts. Barber and Odean (2000) and Barber and Odean (2001) find that overconfident retail investors trade common stock more frequently, which is harmful to their performance.[3]

[3] See also Ben-David, Graham, and Harvey (2013), Campbell, Gallmeyer, Johnson, Rutherford, and Stanley (2011), Deshmukh et al. (2013), Galasso and Simcoe (2011), Gervais, Heaton, and Odean (2011), Goel and Thakor (2008), Hirhsleifer, Low, and Teoh (2012), Malmendier and Tate (2008), Malmendier et al. (2011), and Otto (2014).

Second, we contribute to the literature on the effect of the CFO on corporate financial policies. Chava and Purnanandam (2010) show that the CFO's incentives are related to debt-maturity and earnings-smoothing decisions. Malmendier and Zheng (2012) show that mainly financial outcome variables are associated with CFO overconfidence. Consistent with their paper, we show that a firm's derivative usage, in particular speculation, is affected by CFO overconfidence.

The remainder of the paper proceeds as follows. Section 2 presents our empirical predictions, while Section 3 describes the data. Section 4 contains the empirical analysis on the impact of managerial overconfidence on corporate speculation. In Section 5 we test the robustness of our results, and Section 6 concludes.

2 Empirical Predictions

Overconfidence is usually referred to as an overestimation of the precision of information signals (Lichtenstein, Fischhoff, and Phillips (1982)).[4] The theoretical literature in finance and economics relates overconfidence with excessive trading of financial assets. The intuition behind this relation is that individuals that are overly confident about their information signals and thus their view on the value of a specific asset are more often inclined to trade an asset that they perceive as misvalued.[5]

In the context of derivative usage of corporations, derivative instruments are widely used tools for risk management. However, the implicit leverage in these instruments allows corporations also to use derivatives "selectively" and

[4] There exist two alternative definitions of overconfidence: (i) The better-than-average effect describes the tendency of individuals to overestimate their abilities relative to others. (ii) Illusion of control means that individuals believe to have control over external events. In this paper, we refer to the definition of overconfidence as an overestimation of the precision of information signals.

[5] Theoretical models investigating overconfidence in a financial setting include, for example, Kyle and Wang (1997), Odean (1998), and Gervais et al. (2011).

thus to speculate on rising or falling prices of the underlying.[6] Survey evidence confirms that managers try to incorporate their market views into their risk management decisions. For example, Géczy et al. (2007) find that 40% of surveyed derivative users in their sample speculate at least "sometimes" and relate this to perceived information advantages. As the firms in their sample use foreign exchange or interest rate derivatives, the perceived information advantage seems unlikely in the light of market efficiency. This is also likely to be the case in the gold market.

Hypothesis 1: *Overconfident managers speculate more using derivatives than non-overconfident managers.*

There is no direct implication on the performance of excessive trading of overconfident individuals.[7] The empirical literature, on the other hand, documents a lower risk-adjusted performance in individual brokerage accounts for individuals that engage in excessive trading (Barber and Odean (2000)). In summary, we expect that speculation by overconfident risk managers should not result in positive speculative gains.

Hypothesis 2: *Overconfident Managers realize lower cash flows from speculation than non-overconfident managers*

[6] The term "selective hedging" was first introduced by Stulz (1996) and describes how firms adjust their hedge positions in order to speculate on market movements. We use the terms selective hedging and speculation interchangeably in this paper.

[7] In efficient markets, the price of each financial instrument should reflect its fair value. Thus, positions that result from excessive trading should also have a fair value and should in theory not lead to abnormal positive or negative performance.

3 Data Description

3.1 Sample Selection

We restrict our sample to US and Canadian gold producers because gold mining firms provide detailed information about their derivative holdings in annual and quarterly reports. Therefore, this industry serves as an ideal laboratory to study derivative usage. In particular, firms report information on the type of derivative (forward, spot deferred contract, options, gold loans) as well as strike/forward prices and maturities. The data include only gold derivative positions (i.e., we do not have information about derivative positions in foreign exchange, interest rate or other commodities).[8] The data is taken (i) from a survey conducted by Ted Reeve of Scotia Capital between 1989 and 1999 and (ii) from a survey conducted by GFMS between 2002 and 2011.[9] We check if the data is accurate by manually inspecting quarterly and annual reports of all firms. Derivative data from 2000 and 2001 is manually recorded from quarterly and annual reports. Additionally, we use Compustat to search for gold producers not included in the two surveys by checking all firms with a three-digit SIC code of 104. If these firms report positive gold production figures, we add them to the sample and manually collect derivative positions from quarterly and annual reports.[10] In total, our sample comprises 139 gold producing firms.

Earlier studies on derivative usage in the gold mining industry (e.g., Adam and Fernando (2006)) calculate hedge ratios by using production forecasts over a timespan of five years. For example, the one year hedge ratio

[8] We manually checked annual reports of all firms in our sample and found that about 95% of firms only use gold derivatives.

[9] GFMS was acquired by ThomsonReuters in 2011. Hedge surveys are now available from ThomsonReuters.

[10] For Canadian firms, filings can be downloaded form http://www.sedar.com. For all US firms, we use EdgarPro to download filings.

of a firm is calculated by computing the delta of all outstanding gold derivatives that mature in the upcoming fiscal year and dividing it by the forecasted production in the upcoming fiscal year. In this study, the hedge ratio is calculated by dividing the *total* delta of all derivative positions by the amount of gold reserves that are proven and probable (i.e., economically feasible gold reserves). The amount of proven and probable gold reserves is disclosed by gold mining firms on a yearly basis and gold producing firms are required to report these figures. Further, proven and probable reserve estimations are validated by third party certified geologists. The hedge ratio in this study therefore refers to the fraction of gold reserves that are hedged using gold derivatives. Additionally, we compute hedge ratios by using the annual gold production as the denominator of the hedge ratio. Both reserve and production figures are available from Compustat beginning in 2000. For the time before, these figures are hand collected from annual reports.

The sample of gold producing firms is complemented with financial information on the gold producers from Compustat. For some of the sample firms no financial information is available in Compustat and for these firms, financial information is hand collected from annual reports. Further, information on the management (age, compensation, MBA or PhD for both the CEO and CFO) of the firm is obtained from proxy statements as well as from biographies available on the websites of Forbes and BusinessWeek. This data is used for robustness checks.

3.2 Overconfidence Classification

We classify CEOs and CFOs of all gold producers as overconfident following Malmendier and Tate (2005a) and measure overconfidence based on executive stock option holdings. We use ExecuComp and hand collect compensation data from proxy statements to obtain all available information on stock option grants, exercised options, and existing option holdings. The data

on option grants and option holdings available in ExecuComp and in proxy statements contains option exercises only in a consolidated manner (i.e., details such as exercise price and maturity of the exercised options are not disclosed). Therefore, we follow Hall and Murphy (2002) and apply a first-in-first-out algorithm to construct option portfolios in a given year.[11] We then identify a manager as overconfident if he/she ever holds an option until maturity that is at least 40% in-the-money at the year-end prior to the maturity year.[12] Thus, overconfidence is treated as an inherent, time-invariant personal characteristic of the executive.

The intuition behind using the manager's executive stock option exercise behavior in order to classify him as overconfident is the following: Executives are faced with a trade-off between exercising their options or maintaining the options for later exercise. If an executive keeps the options, he maintains the right to buy the company's stock at potentially better conditions in the future. The downside is that this decision involves costs for the executive in that he will be exposed to idiosyncratic risk. Executive stock options typically have long maturities of about ten years and become vested only after two to four years. Further, managers are not allowed to diversify their exposure for example by short-selling their company's stock. In addition, a large fraction of their wealth is tied to their company which makes diversification with other investments difficult. Lastly, also a substantial fraction of the executive's human capital is linked to the company (Malmendier and Tate (2008)). Thus, executives can be considered as under-diversified investors who have a large exposure to their company's risk. Consequently, rational executives would divest as soon as the option is in-the-money because the cost of delaying exercise usually exceeds

[11] Further details concerning the construction of the option portfolios and the overconfidence classification are discussed in the general Appendix.

[12] The moneyness threshold is derived pursuant to Hall and Murphy (2002) using a risk aversion parameter of 3 and assuming that 67% of the executive's wealth consists of his company's equity. Malmendier and Tate (2005a), who introduced this classification method, did not require a minimum threshold.

its option value. In contrast, executives who are overly confident about their ability to manage their firms and therefore overestimate the firm's future return possibly fail to exercise their stock options in these situations.

One potential concern with the above measurement of overconfidence is that it could also be interpreted as a measure of optimism: Managers might believe that their companies' stock price is too low because they are optimistic about future developments but not necessarily overconfident with respect to their abilities. However, Otto (2014) shows that overconfidence and optimism are highly correlated among managers by analyzing EPS forecasts of large US companies. Therefore, the measure we use in our analysis should also reflect managerial overconfidence.

3.3 Measuring Speculation

Measuring the degree of speculation with (hedge-)derivatives is a difficult task. So far, only a few studies use data on derivative holdings from balance sheets to identify how much firms speculate. Adam, Fernando, and Golubeva (2012) use the variation in hedge ratios during short-term periods. Precisely, they use "the absolute value of the difference in the natural logarithms of the hedge ratios at the beginning and the end of each quarter" (Adam et al. (2012) p. 11). Beber and Fabbri (2012) use an alternative measure and compute first hedge regressions with the hedge ratio as dependent variable and firm characteristics that are standard in the risk management literature as independent variables. Then, they use the residuals of this regression to compute the standard deviation of the residuals for each firm.

We follow both studies and compute two measures of speculation. First, we follow Adam et al. (2012) and compute the coefficient of variation of the hedge ratio for the last four quarters on a rolling basis.[13] Second, we check if

[13] We also check our results for robustness by using other windows and using the last six, eight or ten quarters. Results are discussed in Section 5

our results hold if we follow Beber and Fabbri (2012) and estimate the residual of hedge-ratio regressions and then compute the standard deviation of these residuals. In Figure 1, we illustrate our speculation measure more precisely. The solid line represents the average hedge ratio in the industry over time. The dashed lines represent the averages of the hedge ratio for the last four quarters (benchmark 1) and for the last eight quarters (benchmark 2). These averages can be interpreted as benchmarks and our speculation measure measures how much firms deviated

3.4 Descriptive Statistics

Table 1 presents summary statistics for the sample of gold producers.

[Table 1 here]

In total, we have 659 quarterly observations coming from 40 different firms. The number of firms is relatively small for two reasons.[14] First, we analyze only firms that use derivatives at least once during the sample period. This reduces the sample of all gold producers by approximately 50%. Second, we lose observations because we require that both the CEO and CFO can be identified as overconfident. The overconfidence classification introduced by Malmendier and Tate (2005b) relies on the exercise strategies of managers and classifies managers as overconfident or non-overconfident if they hold in-the-money executive stock options until the last year of maturity. Because these options have usually long maturities ranging to up to ten years, managers need to stay on the payroll of the company for a long time in order to be classified as overconfident or non-overconfident. We lose approximately 65% of the remaining observations because these managers cannot be classified. We lose so many observations because we require that both the CEO and CFO of

[14] Overall, the sample of gold mining firms includes roughly 4000 quarterly observations. For details concerning the sample selection we refer the reader to Section 3.1.

a company can be identified at the same time. In untabulated results we check if summary statistics on the variables presented in Table 1 are different when we use all possible observations and find that firms included in the analyses to follow are similar to the sample of all firms in the gold mining industry.

In Panel A we report summary statistics on derivative and hedge positions of the sample firms. The average company hedges about 6% of all proven and probable reserves, the standard deviation of the hedge ratio is 0.15 and relatively high. When the hedge ratio is measured in terms of annual production, it is (unsurprisingly) higher and the mean is approximately 0.9 (standard deviation of 1.15). The coefficient of variation in the sample firms' hedge ratio illustrates how firms vary their hedge ratios over time. In particular, it is equal to the ratio of the standard deviation of the hedge ratio in the last four quarters to the mean of the hedge ratio in the last four quarters. The mean coefficient of variation is 0.57 indicating that the volatility of the sample firms' hedge ratios is relatively high. This is in line with the findings of Adam and Fernando (2006) who document that a considerable amount of speculation takes place in the gold mining industry. Adam and Fernando (2006) use derivative position to compute the cash flow that results from entering and closing out derivative positions. In addition, they develop a method to divide the cash flow into a speculative part and benchmark part. The benchmark part is computed as the cash flow that would have realized if a company held its hedge ratio constant over the last four quarters. The speculative part is equal to the difference between the total cash flow and the benchmark cash flow. They analyze the cash flow further and find an overall significantly positive derivative cash flow but only small cash flow gains that result from speculation. Cash flow is measured per contract, i.e. total cash flow scaled by the number of derivative contracts outstanding. We use their methodology and also find small cash flow gains (sample mean of 7.07) resulting from speculation, the overall cash flow is negative (mean of -1.81). This may be due to the different

sample periods analyzed. While Adam and Fernando (2006) analyze a time period that ends in 1999 in which the gold price is stagnating, this study analyzes derivative usage between 1992 and 2011. In the last eleven years the gold price is increasing which should lead to negative overall cash flows resulting from the short positions that are typically entered by gold mining firms.[15]

Panel B shows summary statistics on manager characteristics. While 36% of the CEOs are identified as being overconfident, only 17% of the CFOs are identified as overconfident. The finding that overconfidence is more prevalent among CEOs than among CFOs is in line with Malmendier and Zheng (2012). Equity incentives are also more pronounced for CEOs: The average wealth of the CEO increases by $68,000 if the company's stock price increases by one percent while the average CFO's wealth increases by only $12,390.[16] When the volatility of the company's stock price increases by one percent, the CEOs wealth increases by $20,480 while the CFO's wealth increases by only $7,390. The summary statistics indicate that fewer CFOs are overconfident and CFOs have lower equity compensation compared to CEOs.

Lastly, Panel C reports summary statistics for company characteristics of the sample firms. Average firm size (measured as total asset size) is $1.5bn while median assets are only $267mn. Thus, total assets are skewed and therefore we use the log of total assets in later regressions. The mean leverage of sample firms is relatively low with 12%, the average market-to-book ratio is 1.59, 28% of firms pay dividends, firms have a quick ratio of 2.6, an Altman (1968) Z-Score of 3.44 and a return-on-assets of -5.48%.

[15] In the overall sample we identify only two firm quarters where companies hold overall a net long position in derivatives.
[16] All dollar values in this study are nominated in USD currency.

4 Results

4.1 Variation in the Hedge Ratio

In this section, the relation between CEO/CFO overconfidence and corporate speculation is investigated. Before analyzing the variation of the hedge ratio of gold mining firms in a multivariate setting, we first take a look at how the variation in hedge ratios differs among non-overconfident and overconfident managers on average over all firms. Figure 1 illustrates the difference between non-overconfident and overconfident CEOs (Panel A) and non-overconfident and overconfident CFOs (Panel B) over time.[17]

[Figure 1 here]

At first glance, it seems that overconfident managers are more volatile in their speculative activity. Both overconfident CEOs and CFOs demonstrate (on average) peaks in 2001, 2005 and 2010 whereas firms with non-overconfident managers are steadier and less cyclical in their tendency to speculate. When looking at level differences, there is no clear picture for CEOs: During the sample period, overconfident CEOs have a higher variation in only seven out of 17 years. For CFOs, however, we see a different picture. In 14 out of 17 years, firms with overconfident CFOs vary their hedge ratios more often and/or more intensely. Overall, the picture depicted in Figure 1 is consistent with hypothesis 1: Firms with overconfident CFOs seem to speculate more than non-overconfident CFOs. However, no clear picture can be derived for CEOs and the hypothesis that overconfident CEOs are more likely to speculate cannot be corroborated from Figure 1.

[17] The graph starts in 1995 because we are not able to identify any CFOs before that year.

In order to rule out that other factors correlated with overconfidence impact a firm's tendency to speculate, we estimate the following OLS regressions:

$$\begin{aligned} CV(Hedge\ Ratio)_t = \beta * OC(CEO)_{t-1} + \gamma * OC(CFO)_{t-1} \\ + \delta * X'_{t-1} + \alpha + \epsilon_t \end{aligned} \tag{1}$$

where *CV(Hedge Ratio)* is the coefficient of variation in the hedge ratio and our proxy variable for speculation. *OC(CEO)* and *OC(CFO)* are indicator variables that equal one if the CEO/CFO of the company was identified as overconfident and zero otherwise. X is a vector of control variables including *log(total assets)*, *leverage*, the *market-to-book ratio*, the *quick ratio*, *return on assets*, Altman (1968)'s *Z-score*, and equity incentives of the management (*Delta(CEO/CFO)* and *log(vega)(CEO/CFO)*).[18] Additionally, we include quarter and country fixed effects when indicated.

[Table 2 here]

Table 2 presents results for regressions analyzing the relation between managerial overconfidence and corporate speculation. The dependent variable is the coefficient of variation in the hedge ratio as defined as the delta of all gold derivatives over total proven and probable reserves. The results indicate that the hedge ratio of firms with overconfident CFOs is more volatile compared to firms with non-overconfident CFOs. The coefficient of *Overconfident CFO* is significantly positive in all four regression specifications at the one-percent level. Overconfident CEOs, on the other hand, seem not to impact speculation positively. The coefficient is only significantly positive in model (1) and (3) but insignificantly negative in model (4) when we include firm characteristics in the regression. The economic magnitude of the effect of CFO overconfidence on corporate speculation is large: Firms with overconfident CFOs have

[18] For detailed definitions of the variables used we refer the reader to Table 11.

a coefficient of variation in their hedge ratio that is 0.25 higher than that of non-overconfident CFOs. Compared to the overall mean of the coefficient of variation of 0.59 (cf. Table 1) the coefficient underlines the large impact of CFO overconfidence. Turning to the other control variables, we can infer that firms with a higher Z-score and firms with more cash are more likely to speculate. This is consistent with Stulz (1996) who argues that financially sound firms are able to afford potential losses stemming from speculative activities. Furthermore, the vega of the CEO's stock option portfolio is negatively related to speculation while the CFO's vega is positively related to speculation. Theoretically, more option compensation is expected to be positively related to speculation as the value of options increases with volatility. Therefore, the finding for the CFO is in line with this argument while the finding for the CEO's option portfolio is puzzling.

Table 3 presents results for a different specification. The dependent variable here is the coefficient of variation in the hedge ratio defined as the delta of all gold derivatives over annual gold production.

[Table 3 here]

Results are similar to Table 2 and confirm the finding that corporate speculation is related to CFO overconfidence but not to CEO overconfidence. The coefficient of CFO overconfidence is again statistically significant at the one-percent level in all four specifications. The coefficient in model (4) is slightly smaller (0.2), but still large relative to the sample mean of 0.59. The impact of the other control variables is similar as in Table 2.

Overall, Table 2 and 3 suggest that corporate speculation is positively related to CFO overconfidence but not to CEO overconfidence. The economic magnitude that can be derived from the regression results is large. Firms with

overconfident CFOs have a coefficient of variation in their hedge ratio that is between 0.2 and 0.35 higher than that of firms with non-overconfident CFOs.

4.2 Speculative Cash Flows

In this section we analyze the hypothesis whether firms with overconfident managers are able to realize cash flow gains from speculation. Unfortunately, US and Canadian companies do not disclose cash flows that result from derivative transactions. The advantage of analyzing firms in the gold mining industry is that these firms provide detailed data on derivative instruments outstanding at each fiscal quarter (cf. section 3.1). We follow the method developed by Adam and Fernando (2006) to (i) calculate cash flows from derivative transactions and (ii) to classify these cash flows into cash flows that are attributable to hedging transactions and cash flows that are attributable to speculative transactions. In particular, so called "benchmark cash flows" constitute of that part of total cash flows that would have realized if a firm held its hedge ratio constant over the last four quarters. "Speculative cash flows" are equal to the difference between total cash flows and "benchmark cash flows".[19] We estimate the following OLS regressions:

$$\left(\frac{CF}{Number\ of\ contracts}\right)_t = \beta * OC(CEO)_{t-1} + \gamma * OC(CFO)_{t-1} + \delta * CV(Hedge\ Ratio)_{t-1} + \delta * X'_{t-1} + \alpha + \epsilon_t \quad (2)$$

CF is the speculative/benchmark cash flow calculated following Adam and Fernando (2006), *Number of contracts* is the number of gold derivatives outstanding (in ounces). Thus, we analyze the cash flow per derivative contract. *OC(CEO)* and *OC(CFO)* are indicator variables that equal one if the

[19] Details regarding the calculation of derivative cash flows can be found in Adam and Fernando (2006).

CEO/CFO of the company was identified as overconfident and zero otherwise, *CV(Hedge Ratio)* is the coefficient of variation in the hedge ratio over the last four quarters, and X' is a vector of control variables including the same variables as X' in equation (1). We additionally include the coefficient of variation in the hedge ratio in these regressions because the existing literature on trading and performance suggests a negative relationship between higher trading levels and performance.[20] Table 3 presents results of these OLS regressions.

[Table 4 here]

The first result from Table 4 confirms the findings of Barber and Odean (2000). In Panel A, model (1) and (2), we find that companies with more variation in their hedge ratio experience higher losses resulting from speculation. Relative to a company that does not vary its hedge ratio, a company with a coefficient of variation equal to one experiences speculative losses of three to five dollars per gold derivative contract outstanding. In model (3), we additionally include our main variables of interest, *OC(CEO)* and *OC(CFO)*, in the regression. We find that especially overconfident CFOs perform worse. The results suggest that companies with an overconfident CFO realize high speculative losses holding other firm characteristics constant. In particular, these firms experience speculative losses amounting to nine dollars per contract outstanding which can be attributed to the overconfidence of the CFO. The coefficient of *OC(CEO)* is statistically insignificant. In terms of economic significance, the median number of contracts outstanding is equal to 610,000 ounces. Thus, firms with overconfident CFOs incur median losses from speculation amounting to $1.4mn each quarter.

[20] Odean (1999) and Barber and Odean (2000) document that households that trade excessively in their personal portfolios perform worse with their common stock investments. In particular, Barber and Odean (2000) find that households that trade most earn a return of roughly 11.4% compared to a market return of 17.9% during 1991-1996.

Overall, the evidence from Table 3 suggests a negative impact of overconfidence, especially of the CFO, on speculative cash flows. On the other hand, in Panel B we do not find a significant relation between the benchmark cash flow and the variation in the hedge ratio or the overconfidence indicators. Thus, the cash flow resulting from the general hedging activity is not affected by overconfident managers or the variation in hedge ratios.

4.3 Addressing Endogeneity

Hiring an overconfident CEO or CFO might be endogenous and the factors determining the selection of overconfident managers might be correlated with the same variables that drive corporate speculation. We address this problem by using a propensity score matching approach: In the first stage, we estimate the probability that a firm is managed by an overconfident CEO (CFO) using a probit model. We control in the first stage for asset size, the market-to-book ratio, leverage, Altman (1968)'s Z-Score, return on assets, the quick ratio and explicitly for firm age.[21] Hirhsleifer et al. (2012) and Galasso and Simcoe (2011) argue that overconfidence can help a firm to pursue innovation. We use firm age as proxy variable for a company's need for innovation and find in the first stage regression, that younger firms are significantly more likely to hire overconfident CEOs and CFOs. In the second stage regression, we match firms based on their likelihood to be managed by an overconfident CEO (CFO) and match one firm managed by an overconfident CEO (CFO) to another firm that is likely to be managed by an overconfident CEO (CFO) but is indeed managed by a non-overconfident CEO (CFO). Table 5 presents results of the second stage regression.

[Table 5 here]

[21] Firm founding years are hand collected from annual reports and business profiles on CapitalIQ.

Our results from Table 2 are confirmed and we find no significant coefficient for *Overconfident CEO* but a significant positive coefficient for *Overconfident CFO*. The magnitude of the effect is slightly stronger than in Table 2. Thus, our results hold after accounting for a potential endogenous selection of the manager.

We are aware that a propensity score matching approach can only match firms based on observable firm characteristics. There are possibly other, unobservable factors driving speculation and the selection of overconfident managers at the same time. One possibility to control for these factors would be to analyze CEO or CFO turnover and thereby control for unobservable (but time-invariant) effects. Unfortunately, the sample of gold mining firms is relatively small and other restrictions such as derivative usage as well as the classification method to identify overconfidence reduce the sample size even further. After accounting for these restrictions, we are left with only four CFO changes which makes it impossible to analyze turnover to control for unobservable effects.[22]

5 Robustness

5.1 Sample Selection

The analysis so far contains only firms that use derivatives. Thus, a firm decides to use derivatives in a first step and is then able to use these derivatives to bet on market movements. To mitigate concerns that our analysis is prone to selection bias, we use Heckman (1976)'s approach to correct for sample selection by estimating a first stage probit regression to model the decision to use derivatives and then incorporating a transformation of the estimated probability in a second stage regression (otherwise identical to model 1). Results are shown in Table 6.

[22] In untabulated results, we also check if corporate speculation changes after overconfident CEOs are hired and find no effect confirming our previous results.

[Table 6 here]

Our results are robust to sample selection concerns. The first stage regression suggests that larger firms are more likely to use derivatives, and that dividend paying firms and firms with more cash are less likely to use derivatives. In the second stage regression, the effect of *CFO overconfidence* is similar as in Table 2.

5.2 Alternative Overconfidence Measures

We test if our results are robust to the moneyness threshold of the overconfidence classification in Table 7.

[Table 7 here]

In particular, we replicate Table 2 and identify managers as overconfident if they ever hold options until one year prior to maturity that are at least 20% (model 1), 60% (model 2) or 80% in-the-money (model 3). The results confirm our findings: In all three specifications, there is a statistically significant relation between CFO overconfidence and speculation but no statistically significant relation between CEO overconfidence and speculation.

We also test our results for robustness using the classification proposed by Sen and Tumarkin (2009). The drawback of this method is that it uses information about stockholdings of managers and this reduces the sample size of identifiable CFOs significantly as most of the companies in our sample are Canadian and in Canada CFOs do not have to report stockholdings if these are below a certain threshold. For the CEO, we find no significant impact of overconfidence on speculation in untabulated results confirming our previous results.

5.3 Alternative Speculation Measures

We also test our results for robustness by using other proxy variables for speculation. Our proxy variable for speculation in section 4.1 uses information about the the hedge ratio in the last four quarters and is equal to the coefficient of variation in the hedge ratio during that time period. We additionally replicate Table 2 by computing the coefficient of variation in the hedge ratio for the last six, eight, and ten quarters. Results are presented in Table 8.

[Table 8 here]

We find that our results are robust to different windows used to calculate the coefficient of variation, the coefficient is significantly positive for all specifications. In all specification, the coefficient is even greater in magnitude.

Beber and Fabbri (2012) propose an alternative measure for corporate speculation. They use data on S&P500 firms between 1996 and 2001 and analyze firms with positive foreign sales and firms reporting foreign exchange (FX) derivative usage. Gross notional values of FX derivatives are used to compute a hedge ratio using total assets as the denominator. Then, this hedge ratio is regressed on firm fundamentals such as assets, leverage, and the market-to-book ratio in a first stage regression. To measure speculation, they use the standard deviation of the residual from the first-stage regression for each firm (during the time the firm is included in their sample).

We follow Beber and Fabbri (2012) and first compute residuals from a standard hedging regression using the same control variables including firm fixed effects. In the second stage regression, we regress the standard deviation of the residuals for each firm on the same control variables as in Table 2.[23] Results are presented in Table 9.

[23] This results in one observation for each CEO/CFO combination within a firm explaining the low number of observations in Table 8.

[Table 9 here]

Results confirm the findings from our main regressions. Overconfident CFOs have a significant positive effect on corporate speculation using the speculation measure of Beber and Fabbri (2012) whereas overconfident CEOs do not significantly affect a firm's tendency to speculate. Also the economic magnitude of the effect for CFOs is high. The sample mean for the standard deviation of the residual for all firms is equal to 0.03 such that the coefficient of *Overconfident CFO* represents 100% of the overall mean.

5.4 Other Managerial Characteristics

Bertrand and Schoar (2003) document that manager fixed effects are able to explain a large portion of the variation in corporate financial policies. Based on their results, a number of empirical studies analyze how managerial characteristics such as age, gender, or education can affect specific corporate financial policies such as investment (Huang and Kisgen (2013)) or buyouts (Kaplan, Klebanov, and Sorensen (2012)). Related to our analysis, Beber and Fabbri (2012) show that younger managers and managers with an MBA speculate more. To rule out that our results are driven by a correlation between overconfidence and other personal characteristics such as age, education, and gender, we check our results for robustness by including a gender dummy, age, PhD and MBA dummies in our baseline regression 1. Results are presented in Table 10.

[Table 10 here]

We find that including other managerial characteristics does not change our previous results. In our sample there is no variation in the variables *PhD (CFO)* and *Male (CEO)* (i.e., all of the CFOs in the sample do not have PhDs

and none of the CEOs is female). Of the other coefficients, only *Male (CFO)* is significantly different from zero suggesting that male CFOs are less likely to speculate. As before, the coefficient of *CFO Overconfident* is statistically significant from zero suggesting that firms with overconfident CFOs speculate more when we control for other personal characteristics of the management.

6 Conclusion

This paper investigates how a firm's tendency to speculate with derivatives is impacted by overconfidence of the CEO and CFO . Overconfident managers overestimate their abilities and the precision of their information signals and should therefore be more likely to bet on market movements using hedge derivatives. We find that firms with overconfident CFOs have higher variations in their hedge ratio which is consistent with the aforementioned hypothesis. On the other hand, we find no measurable effect of CEO overconfidence on speculation. This result is in line with the findings of Malmendier and Zheng (2012) who show that overconfidence of the CFO is significantly related to financial outcome variables.

If excessive trading by overconfident CFOs is triggered by false beliefs about the precision of a manager's information we should also expect no superior performance resulting from speculation. This is also what we find in the data – speculative cash flows are negatively related to CFO overconfidence. Overall, our findings suggest that overconfidence can have a significant impact on a firm's derivative usage and in particular on a firm's tendency to speculate.

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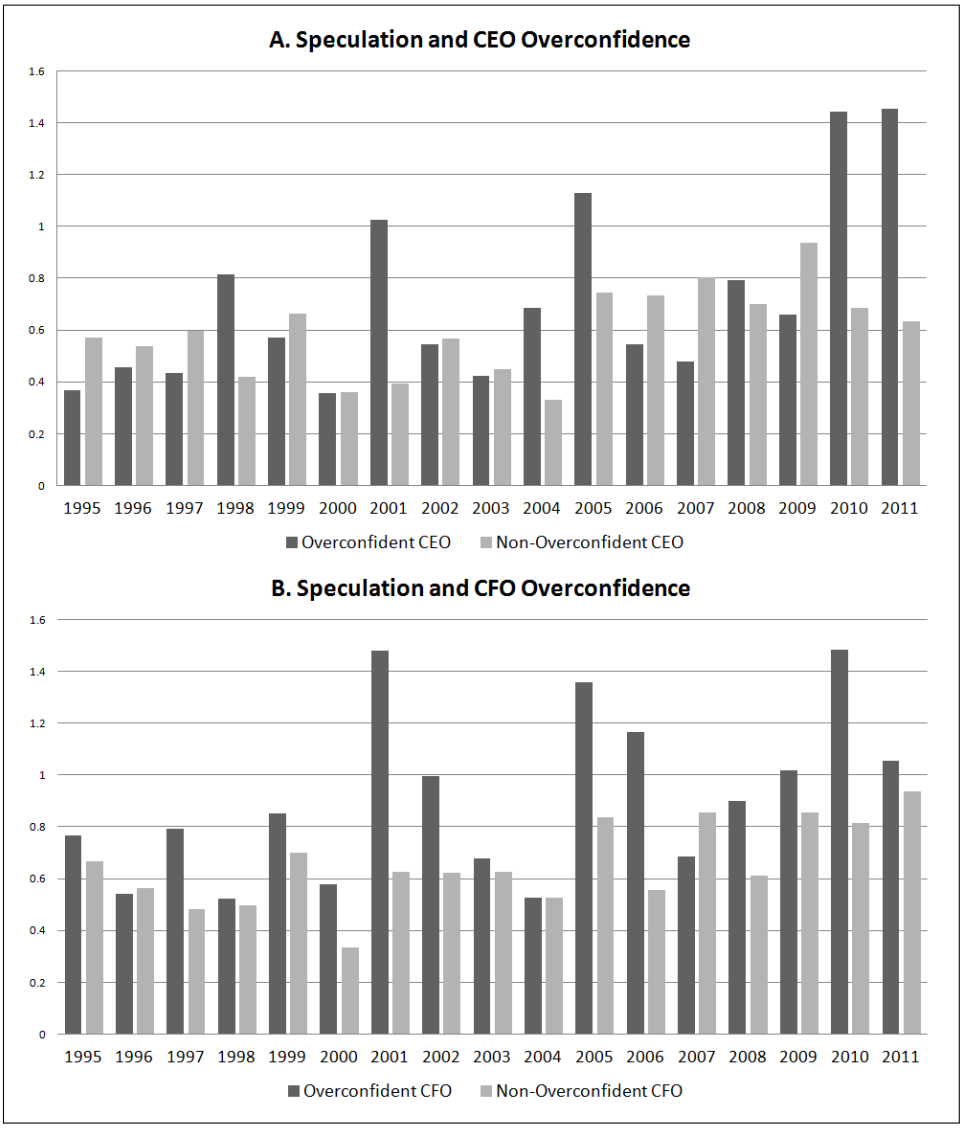
Appendix

A.1 Figures

Figure 1: Speculation and Overconfidence

This figure shows the mean yearly coefficient of variation in the hedge ratio for firms with overconfident and rational managers. The first graph (A) shows differences between firms with rational and overconfident CEOs, the second one (B) differences between firms with rational and overconfident CFOs.



A.2 Tables

Table 1: Descriptive Statistics

This table reports descriptive statistics for the sample of gold producers between 1992 and 2011. All variables are defined in Table 11.

	Mean	Median	Std. Dev	p1	p99	Obs.
A: Derivative Position						
Hedge Ratio (Res.)	0.08	0.04	0.12	0.00	0.59	659
Hedge Ratio (Prod.)	0.95	0.49	1.22	0.00	6.67	659
Coeff. of Var. - HR (Res.)	0.59	0.41	0.55	0.03	2.00	659
Coeff. of Var. - HR (Prod.)	0.59	0.40	0.55	0.03	2.00	659
CF per Oz	−1.81	0.00	35.01	−145.29	99.90	659
Pred. CF per Oz	−8.88	0.00	48.70	−209.30	98.72	659
Spec. CF per Oz	7.07	0.00	34.57	−78.38	152.52	659
B: Manager Characteristics						
OC(CEO) (0/1)	0.36	0.00	0.48	0.00	1.00	659
OC(CFO) (0/1)	0.17	0.00	0.38	0.00	1.00	659
Delta (CEO)	67.85	27.35	155.45	1.29	1386.58	659
Delta (CFO)	12.39	4.87	25.82	0.00	220.95	659
Vega (CEO)	20.48	8.96	51.26	0.02	476.35	659
Vega (CFO)	7.39	2.49	22.98	0.00	217.99	659
C: Company Characteristics						
Total Assets (in USD mn)	1456.04	267.12	3783.49	16.66	25996.00	659
Leverage	0.12	0.09	0.11	0.00	0.50	659
Market-To-Book	1.59	1.36	1.00	0.36	5.14	659
Dividends Paid (0/1)	0.28	0.00	0.45	0.00	1.00	659
Quick Ratio (%)	2.56	1.56	2.88	0.12	13.98	659
Altman Z-Score	3.44	2.56	4.87	−3.59	21.87	659
Return on Assets (%)	−5.48	−1.85	19.52	−84.49	24.97	659

Table 2: Speculation and Overconfidence: Variation in Hedge Ratios (Reserves)

This table reports results for OLS regressions. The dependent variable is the coefficient of variation in the hedge ratio (reserves) for the last four quarters. The main variables of interest are *OC (CEO)* and *OC (CFO)*, which are indicator variables that equal one if the CEO/CFO of the firm was classified as overconfident. All other independent variables are defined in Table 11. Standard errors are heteroskedasticity robust and clustered both at the firm and fiscal quarter level to account for non-independent observations within firms and time. *, **, *** indicate statistical significance at the 10%, 5% and 1% level respectively.

Dependent Variable: Coefficient of Variation in Hedge Ratio (Reserves)

	(1)	**(2)**	**(3)**	**(4)**
A: Overconfidence				
OC (CEO)	0.187**		0.146*	0.092
	(0.077)		(0.088)	(0.093)
OC (CFO)		0.298***	0.288***	0.248***
		(0.091)	(0.068)	(0.090)
B: Firm Characteristics				
log(Total Assets)				−0.028
				(0.034)
Market-to-Book				−0.032
				(0.044)
Leverage				−0.357
				(0.272)
Dividends Paid				−0.019
				(0.095)
Z-Score				0.023**
				(0.011)
Return on Assets				0.001
				(0.001)
Quick Ratio				0.026**
				(0.012)
Delta (CEO)				0.000
				(0.001)
Delta (CFO)				−0.002
				(0.005)
Log(Vega(CEO))				−0.136***
				(0.042)
Log(Vega(CFO))				0.151***
				(0.052)
Quarter Fixed Effects	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes
Observations	1,163	903	730	659
Adjusted R^2	0.073	0.042	0.099	0.229

Table 3: Speculation and Overconfidence: Variation in Hedge Ratios (Production)

This table reports results for OLS regressions. The dependent variable is the coefficient of variation in the hedge ratio (production) for the last four quarters. The independent variables are the same as in Table 2 and are defined in Table 11. Standard errors are heteroskedasticity robust and clustered both at the firm and fiscal quarter level to account for non-independent observations within firms and time. *, **, *** indicate statistical significance at the 10%, 5% and 1% level respectively.

Dependent Variable: Coefficient of Variation in Hedge Ratio (Production)

	(1)	(2)	(3)	(4)
A: Overconfidence				
OC (CEO)	0.249***		0.160*	0.104
	(0.079)		(0.083)	(0.092)
OC (CFO)		0.346***	0.324***	0.206***
		(0.080)	(0.067)	(0.073)
B: Firm Characteristics				
log(Total Assets)				−0.035
				(0.032)
Market-to-Book				−0.015
				(0.041)
Leverage				−0.419
				(0.269)
Dividends Paid				−0.012
				(0.096)
Z-Score				0.016*
				(0.009)
Return on Assets				0.000
				(0.001)
Quick Ratio				0.032**
				(0.012)
Delta (CEO)				0.000
				(0.001)
Delta (CFO)				−0.002
				(0.005)
Log(Vega(CEO))				−0.135***
				(0.037)
Log(Vega(CFO))				0.141***
				(0.050)
Quarter Fixed Effects	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes
Observations	1,211	932	759	659
Adjusted R^2	0.049	0.055	0.087	0.271

Table 4: Cash Flow and Overconfidence

This table reports results for an OLS regression. The dependent variables is the speculative (Panel A) and the benchmark cash flow (Panel B) scaled by the number of derivative contracts outstanding. The independent variables are the same as in Table 2 and are defined in Table 11. Standard errors are heteroskedasticity robust and clustered both at the firm and fiscal quarter level to account for non-independent observations within firms and time. *, **, *** indicate statistical significance at the 10%, 5% and 1% level respectively.

Panel A: Speculative Cash Flow (per derivative contract)

	(1)	**(2)**	**(3)**
A: Speculation			
Variation in Hedge Ratio	-3.997^{***}	-5.413^{***}	-5.633^{*}
	(0.976)	(1.476)	(2.814)
B: Overconfidence			
OC (CEO)			1.171
			(2.829)
OC (CFO)			-8.898^{*}
			(5.163)
Control Variables	No	Yes	Yes
Quarter Fixed Effects	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes
Observations	2,061	1,965	643
Adjusted R^2	0.005	0.070	0.071

Panel B: Benchmark Cash Flow (per derivative contract)

	(1)	**(2)**	**(3)**
A: Speculation			
Variation in Hedge Ratio	5.467	5.148	6.793
	(2.108)	(3.043)	(6.370)
B: Overconfidence			
OC (CEO)			−5.255
			(6.867)
OC (CFO)			12.798
			(11.965)
Control Variables	No	Yes	Yes
Quarter Fixed Effects	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes
Observations	2,061	1,454	643
Adjusted R^2	0.006	0.160	0.153

Table 5: Propensity Score Matching

This table reports results for the second stage of a propensity score matching model. The dependent variable is the coefficient of variation in the hedge ratio (reserves) for the last four quarters. The independent variables are the same as in Table 2 and are defined in Table 11. The propensity scores are estimated in the first stage by a probit regression using a dummy variable as the dependent variable that equals one if the firm is managed by an overconfident CEO (column 1) or an overconfident CFO (column 2). Standard errors are heteroskedasticity robust and clustered both at the firm and fiscal quarter level to account for non-independent observations within firms and time. *, **, *** indicate statistical significance at the 10%, 5% and 1% level respectively.

Dependent Variable: Coefficient of Variation in Hedge Ratio (Reserves)

	(1)	**(2)**
A: Overconfidence		
OC (CEO)	0.139	
	(0.091)	
OC (CFO)		0.417**
		(0.185)
Control Variables	Yes	Yes
Quarter Fixed Effects	Yes	Yes
Country Fixed Effects	Yes	Yes
Observations	420	130
Adjusted R^2	0.242	0.276

Table 6: Robustness: Heckman Selection Model

This table reports results for the first and second stage of a heckman selection model. The dependent variable in the first stage is a dummy variable that equals one if a firm uses derivatives and zero otherwise, the dependent variable in the second stage is the coefficient of variation in the hedge ratio (reserves/prod.) for the last four quarters. The independent variables in the first stage are the same as in Table 2 except the overconfidence indicators, the independent variables in the second stage are the same as in Table 2. All variables are defined in Table 11. Standard errors are based on the two-step variance estimator introduced by Heckman (1976). *, **, *** indicate statistical significance at the 10%, 5% and 1% level respectively.

A. Main (Second Stage) Regression - Dependent Variable: Coefficient of Variation

OC (CEO)	−0.070
	(0.043)
OC (CFO)	0.291***
	(0.055)
Control Variables	Yes
Quarter Fixed Effects	Yes
Country Fixed Effects	Yes
(Uncensored) Observations	612

B. First Stage Regression - Dependent Variable: Hedge Indicator

Log(Assets)	0.269***
	(0.037)
MTB	−0.045
	(0.041)
Leverage	−0.229
	(0.278)
Dividends paid (0/1)	−0.249**
	(0.112)
Z-Score	0.004
	(0.006)
ROA	0.002
	(0.002)
Quick Ratio	−0.061***
	(0.013)
Delta (CEO)	−0.001***
	(0.000)
Log(Vega(CEO))	−0.015
	(0.052)
Delta (CFO)	−0.011***
	(0.002)
Log(Vega(CFO))	0.210***
	(0.066)
Quarter Fixed Effects	Yes
Country Fixed Effects	Yes
(Censored) Observations	1,803
χ^2	163.856

Table 7: Robustness: Alternative Overconfidence Classifications

This table reports results for OLS regressions. The dependent variable is the coefficient of variation in the hedge ratio (reserves) for the last four quarters. *OC CEO (20%/60%/80%)* and *OC CFO (20%/60%/80%)* are indicator variables that equal one if the CEO/CFO is classified as overconfident, i.e. if the CEO/CFO ever held an option until the final maturity year, which is at least 20%, 60%, or 80% in the money and zero otherwise. The other independent variables are the same as in Table 2 and are defined in Table 11. Standard errors are heteroskedasticity robust and clustered both at the firm and fiscal quarter level to account for non-independent observations within firms and time. *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

Dependent Variable: Coefficient of Variation in Hedge Ratio (Reserves)

	(1)	**(2)**	**(3)**
A: 20% Threshold			
OC (CEO)	0.037		
	(0.084)		
OC (CFO)	0.178*		
	(0.098)		
B: 60% Threshold			
OC (CEO)		−0.002	
		(0.095)	
OC (CFO)		0.168*	
		(0.088)	
C: 80% Threshold			
OC (CEO)			0.004
			(0.094)
OC (CFO)			0.185**
			(0.083)
Control Variables	Yes	Yes	Yes
Quarter Fixed Effects	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes
Observations	633	633	649
Adjusted R^2	0.209	0.221	0.220

Table 8: Robustness: Different Windows

This table reports results for OLS regressions. The dependent variable is the coefficient of variation in the hedge ratio (reserves) for the last six, eight, and ten fiscal quarters. The independent variables are the same as in Table 2 and are defined in Table 11. Standard errors are heteroskedasticity robust and clustered both at the firm and fiscal quarter level to account for non-independent observations within firms and time. *, **, *** indicate statistical significance at the 10%, 5% and 1% level respectively.

Dependent Variable: Coefficient of Variation in Hedge Ratio (Reserves)

	6 qts.	**8 qts.**	**10 qts.**
A: Overconfidence			
OC (CEO)	−0.019	−0.074	−0.121
	(0.084)	(0.087)	(0.095)
OC (CFO)	0.290***	0.351***	0.363***
	(0.092)	(0.119)	(0.136)
Control Variables	Yes	Yes	Yes
Quarter Fixed Effects	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes
Observations	630	610	587
Adjusted R^2	0.225	0.222	0.229

Table 9: Robustness: Alternative Measurement of Speculation

This table reports results for an OLS regression. The dependent variable is the speculation measure proposed by Beber and Fabbri (2012). This measure is computed by estimating a first stage regression using the hedge ratio (reserves) as the dependent variable and standard hedging control variables as independent variables. The standard deviation of the residual of this regression during the tenure of CEO/CFO pairs is used to measure speculation and is regressed on the same control variables as in Table 2. All variables are defined in Table 11. Standarderrors are heteroskedasticity robust and clustered at the firm level to account for non-independent observations within firms. *, **, *** indicate statistical significance at the 10%, 5% and 1% level respectively.

Dependent Variable: Standard Deviation of Residual (Beber and Fabbri (2012))

	(1)
A: Overconfidence	
OC (CEO)	−0.013
	(0.011)
OC (CFO)	0.029**
	(0.014)
Observations	61
Adjusted R^2	0.076
Control Variables	Yes
Country Fixed Effects	Yes

Table 10: Robustness: Manager Characteristics

This table reports results for an OLS regression. The dependent variable is the coefficient of variation in the hedge ratio (reserves) for the last four quarters. The independent variables are the same as in Table 2 and are defined in Table 11. Standard errors are heteroskedasticity robust and clustered both at the firm and fiscal quarter level to account for non-independent observations within firms and time. *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

Dependent Variable: Coefficient of Variation in Hedge Ratio (Reserves)

	(1)
A: Overconfidence	
OC (CEO)	0.067
	(0.111)
OC (CFO)	0.254**
	(0.099)
B: Other Characteristics	
PhD (CEO)	0.094
	(0.112)
MBA (CEO)	0.066
	(0.199)
MBA (CFO)	−0.043
	(0.073)
Male (CFO)	−0.370**
	(0.149)
Age (CEO)	−0.002
	(0.005)
Age (CFO)	−0.006
	(0.004)
Control Variables	Yes
Quarter Fixed Effects	Yes
Country Fixed Effects	Yes
Observations	615
Adjusted R^2	0.231

Table 11: Variable Definitions

Variable Name	Definition and/or Compustat item
Managerial Characteristics (defined for CEO and CFO separately):	
Overconfident	Equal to one if a manager holds executive stock options until the last year of maturity that are at least 40% in-the-money and zero otherwise.
Delta	Overall delta of the option and stock portfolio held by a manager divided by total shares outstanding. The individual stock delta is one per definition, the delta of an individual option is defined as $e^{-dT}N(Z)$.
Vega	$\frac{e^{-dT}N^{'}(Z)ST^{1/2}*(0.01)}{SharesOutstanding}$. In our regressions we use $log(1+vega)$ to correct for the skewness of vega. where: $Z = \left[ln\left(S/X\right) + T\left(r - d + \sigma^2/2\right)\right]/\sigma T^{1/2}$ N = cumulative probability function for the normal distribution $N^{'}$ =normal density function. S = price of the underlying stock X = exercise price of the option σ = expected stock-return volatility over the life of the option r = natural logarithm of the risk-free rate T = time to maturity of the option in years d = natural logarithm of expected dividend yield over the life of the option
Male	A dummy variable, which equals one if the manager is female.
Ph.D.	A dummy variable, which equals one if the manager holds a Ph.D. degree.
MBA	A dummy variable, which equals one if the manager holds an MBA degree.
Age	Age of the manager in years at the time of the debt issue.
Company characteristics:	
Total Assets	Firm's total book assets in $million in 2011 dollars.
Market-to-Book	Market value of the firm divided by the book value of assets.

Continued on next page

Table 11 – continued from previous page

Variable Name	Definition and/or Compustat item
Leverage	Long-term debt plus short-term debt plus preferred equity divided by total book assets.
Quick Ratio	Cash and short term investments plus receivables divided by current liabilities.
Z-Score	Altman (1968)'s Z-Score.
Return on Assets	EBITDA divided by total assets.
Proven & Prob. Reserves	Amount of gold that is economically feasible for mining (in troy oz).
Annual Gold Production	Number of ounces of gold produced in the fiscal year (in troy oz).
Derivative Portfolio Characteristics:	
Hedge Ratio	Delta of all gold derivatives divided by gold reserves or gold production.
Coeff. of Variation - HR	Standard deviation of the hedge ratio dividided by the mean of the hedge ratio.
Total CF	Cash flow of gold derivatives approximated using the method by Adam and Fernando (2006).
Benchmark CF	Cash flow of gold derivatives that would have realized if the hedge ratio would have been held constant over the last four quarters.
Spec. CF	Difference of *CF from Gold Derivatives* and *Pred. CF from Gold Derivatives*.

Corporate Payout Policy and Managerial Optimism

Valentin Burg

Abstract:

We analyze the relation between managerial optimism and corporate payout policy. We predict that optimistic managers perceive their firm's equity to be undervalued and therefore prefer share repurchases over dividends when distributing cash to shareholders. Using data from S&P 1,500 firms between 1992 and 2010, we find that optimistic CEOs engage in more repurchase activity when measured as a fraction of total payouts and total assets. We find no effect of managerial optimism on total payouts. The latter is a surprising result because existing evidence suggests that optimistic CEOs prefer to fund investment projects internally - and thus would be expected to retain excess cash.

Keywords: Manager Characteristics, Optimism, Payout Policy, Share Repurchases, Dividends

JEL-Classification: G02, G30, G32, G35

1 Introduction

Determining corporate payout and dividend policy is among the most important strategic decisions faced by corporate executives. There is a lively debate on whether it is optimal to channel excess cash to shareholders via dividends or via share repurchases, however, there is still no conclusive answer (Baker, Powell, and Veit (2002)). While existing research mainly focuses on firm and market characteristics, recent studies show that also managerial traits strongly shape corporate financial decisions (Bertrand and Schoar (2003)). A widely recognized bias is managerial optimism, which is based on psychological findings and implies that people tend to think that favorable future events are more likely than they are in reality.[1] Hackbarth (2008) incorporates this bias in a trade-off model of capital structure. He shows that optimistic managers are reluctant to raise external funds because they view their company as undervalued and believe that external funds are unduly costly. This finding has direct implications for corporate payout policy: (i) optimistic managers should pay out less compared to rational managers in order to have sufficient internal funds to avoid dependence on costly external capital. (ii) Since optimistic managers perceive their company to be undervalued, buying back the company's shares is a positive NPV project for an optimistic manager: Wealth can be transferred from short-term traders to long-term shareholders (Ikenberry and Vermaelen (1996)).

Both arguments have an impact on the optimal payout channel design of a company. While the first argument applies to both dividends and share repurchases the second argument is only valid for repurchases. If optimistic managers rely more on internal cash flow they should pay out less dividends. The effect on share repurchases, however, is less clear: If the perceived benefits

[1] Ben-David, Graham, and Harvey (2013) shows that miscalibration is widespread among financial executives. According to their results, financial executives are biased in their estimation of future events. One possible reason for the bias is executive optimism.

from market timing are larger than the costs associated with paying out excess cash, then optimistic managers should use more share repurchases relative to rational managers and vice versa. However, conditional on paying out cash, optimistic managers should always rely more on share repurchases.

We study these predictions using a comprehensive dataset covering all CEOs contained in the ExecuComp database for the time period 1992 to 2010. Following Malmendier and Tate (2005a), managers are classified as optimistic if they ever hold an option until maturity which is at least 40% in-the-money at the year-end prior to maturity. The reasoning behind this methodology is that executives are typically badly diversified and hence should exercise executive options as soon as possible to reduce their exposure to firm-specific risk. Optimism is considered as an inherent, time-invariant personal characteristic of the executive. Controlling for observable firm and manager characteristics, we find that optimistic CEOs pay out 8-10% more of excess cash in form of share repurchases compared to rational CEOs. Given the average fraction of share repurchases over total payouts of 50%, this effect is economically significant. Disentangling the effects for share repurchases and dividends, we find that optimistic CEOs also repurchase more shares when measured as a fraction of total assets. We do not find significant differences between rational and optimistic managers for total payouts. Our results also hold when we control for unobservable firm characteristics that are constant over time. In particular, we employ a difference-in-difference methodology surrounding CEO turnover and find that incoming optimistic CEOs engage in more repurchase activity after being hired.

This paper adds to the ongoing discussion on how managerial biases affect corporate financial policies. We are among the first to analyze the impact of optimism on payout policy in general and share repurchases in particular. To the best of our knowledge, two papers analyze the relation between payout

policy and optimism. We confirm the findings of Banerjee, Humphrey-Jenner, and Nanda (2014) and show that optimistic CEOs prefer repurchases over dividends relative to rational CEOs. In addition, we analyze dividend decisions and mitigate endogeneity concerns by showing that this result holds after accounting for unobservable variables using CEO changes. Deshmukh, Goel, and Howe (2013) also find that optimistic managers pay lower dividends, which is consistent with the argument that optimistic managers prefer to retain cash to finance future investment projects. However, their sample is limited to 1984-1994, a period where share repurchases were of minor importance for corporations. Therefore the authors focus on the dividend hypothesis. We contribute to the existing literature by explicitly investigating the interplay between CEO optimism and the choice between dividends and share repurchases, showing that optimistic managers adjust the payout channel towards a larger fraction of share repurchases to total payouts. We thereby show that both the internal cash hypothesis (i) and the market timing hypothesis (ii) impact the payout channel choice by optimistic managers.

The paper is organized as follows. We develop our empirical hypotheses in section 2. Section 3 describes the data sample and presents summary statistics. Section 4 discusses the results. In section we check results for robustness. Section 6 concludes.

2 Empirical Predictions

Hackbarth (2008) incorporates managerial traits, in particular optimism and optimism, in a trade-off model of capital structure.[2] He shows that optimistic managers are reluctant to raise external funds because they view their

[2] Managerial optimism is usually defined as the underestimation of the variance of future cash flows by the acting manager. Overoptimism is defined as the overestimation of the mean of future cash flows by the acting manager. In the following we use the term optimism. However, our prediction apply both to optimistic and overoptimistic managers.

own company as undervalued and believe that external funds are unduly costly. These results provide the basis for our empirical predictions.

When a manager perceives his company to be undervalued, the company's investment opportunity set is expanded, as repurchases offer an additional positive NPV project (Ikenberry and Vermaelen (1996)). The manager can use the firm's resources to benefit from perceived misvaluations and transfer wealth from short-term traders to long-term shareholders of the firm. On the one hand, optimistic managers perceive their companies to be undervalued because they systematically overestimate the mean of future cash-flows. As a consequence, they overestimate the value they can realize via share repurchases and may engage in more repurchase activity. On the other hand, an optimistic manager will be reluctant to issue (in his/her view) overly costly securities such as debt or equity to fund his investment opportunities and is therefore expected to retain cash for future investment spending in order to fund investment projects internally.
Essentially, there are two counterbalancing effects: First, buying back the company's shares is perceived as an attractive investment. Second, as optimistic managers are reluctant to issue debt or equity securities because of the perceived undervaluation of these securities, they prefer not to pay out cash to shareholders in the form of dividends or share repurchases. However, conditional on paying out excess cash via dividends or share repurchases, an optimistic manager is more likely to buy back shares rather than to pay out dividends because share repurchases benefit the existing shareholders by exploiting the perceived mispricing.

Hypothesis 1: Optimistic managers will distribute a higher fraction of total payouts via share repurchases compared to rational managers.

When measuring share repurchases in absolute terms (e.g. as a fraction of total assets), it is an empirical question which of the two effects dominates.

If the effect of the perceived undervaluation of the company's equity outweighs the effect of the higher costs to raise external capital, the following hypothesis holds.

Hypothesis 2a: Optimistic managers will engage in more share repurchases compared to rational managers in terms of total assets.

On the other hand, if the manager perceives the cost of raising external finance higher than the benefit of buying back undervalued equity, it follows:

Hypothesis 2b: Optimistic managers will engage in less share repurchases compared to rational managers in terms of total assets.

A prediction about the dividend policy is more straightforward. The first effect does not apply in this context as dividends are not more attractive when the company's stock price is misvalued and firms managed by optimistic managers are expected to pay less dividends compared to firms managed by rational managers, also in absolute terms. Thus, we predict analogue to Deshmukh et al. (2013):

Hypothesis 3: Optimistic managers will distribute a lower amount of cash dividends compared to rational managers in terms of total assets.

Finally, the question is how the effect of optimism affects total payouts. If dividends are reduced more heavily than share repurchases are increased, firms run by optimistic managers will have lower total payouts compared to rational managers.

Hypothesis 4a: Optimistic managers will pay out less compared to rational managers.

If share repurchases are increased more heavily than dividends are decreased, optimistic managers will even have higher total payouts compared to rational managers.

Hypothesis 4b: Optimistic managers will pay out more compared to rational managers.

3 Sample and Variable Description

3.1 Measurement of Optimism

We start by identifying CEOs as either rational or optimistic following Malmendier and Tate (2005b) and measure optimism based on an executive's option exercise behavior. We use ExecuComp to obtain detailed information on executive stock option grants, the number of exercised options, and option holdings. We restrict our sample to the 1992 to 2010 period and exclude firms with SIC codes between 6000-6999 (financial firms). As ExecuComp reports option exercises only in an aggregated manner, we follow Hall and Liebman (1998) and apply a first-in-first-out method to compute the option portfolios of managers in each year.[3] We classify executives as optimistic if they ever hold an option until maturity that is at least 40% in-the-money at the year-end prior to its maturity.[4]

The intuition behind this classification into rational or optimistic managers is the following: Executives face a trade-off when they decide whether they will exercise their options or keep the options with the intention to exercise them later. If they keep the options, they might be able to purchase company stock at more favorable conditions in the future. The cost of this strategy is that the executive exposes himself to idiosyncratic risk. Diversi-

[3] See the Appendix 1 in Hall and Liebman (1998) and the general Appendix of this dissertation for further details.

[4] The 40% threshold is derived following Hall and Murphy (2002) using a constant risk aversion parameter of 3 and 67% of wealth in the company's stock.

fying this exposure is difficult for three reasons: First, executives are legally prohibited to short sell their company's equity. Second, a large fraction of an executive's personal wealth is tied to their company and therefore diversification abilities across other investments are limited. Third, additionally a not negligible fraction of the executive's human capital is linked to the company's value (Malmendier and Tate (2008)). For these reasons, executives seem to be under-diversified investors with a large exposure to their company's value and risk. Rational executives should therefore exercise their executive stock options once the options are sufficiently in-the-money. On the other hand, managers who are overly optimistic and therefore overestimate their company's future return are likely to fail to exercise their stock options in these situations.

3.2 Measuring Share Repurchases

Measuring the extent to which a company buys back its own shares can be done using various data sources. Banyi, Dyl, and Kahle (2008) test which measure of share repurchases is the most accurate and suggest using the Compustat item *purchases of common and preferred stock* adjusted for any decrease in the *redemption value of preferred stock*. We follow Banyi et al. (2008) and use this measure of share repurchases.

3.3 Control Variables

The wide empirical literature on share repurchases and dividends suggests a number of control variables in payout regressions. We control in our regressions for several variables that are expected to have an influence on the payout policy of a firm.

Jensen (1986) argues that agency costs are imposed on firms with high free cash flows because managers in these firms may use the excess cash to fund suboptimal projects. When a firm has excess cash resources that it does not

want to retain, it can either distribute its excess cash in the form of dividends or share repurchases to its shareholders. DeAngelo, DeAngelo, and Stulz (2006) argue that free cash flow problems are an important driver for a company's dividend policy. While younger firms with fewer internal cash flows and abundant investment opportunities pay few dividends, mature firms with abundant internal cash and fewer investment opportunities optimally pay higher dividends to avoid investments in pet projects. We control for cash holdings in our regressions by using the ratio of cash and marketable securities (Compustat item # 1) to total assets (Compustat item # 6). Additionally, we include the market-to-book ratio ((Compustat item #199 * item #25 + item #10 + item #181) divided by total assets (item #6)) to control for growth opportunities and the logarithm of total assets (Compustat item #6) to control for size effects.

When firms buy back their own shares, they reduce the market value of equity by the repurchased amount and thus increase their leverage. Therefore, repurchases can be used to adjust their current capital structure (Dittmar (2000)). Assuming an optimal leverage ratio exists, share repurchases can be used to increase leverage in order to revert to the optimal capital structure when the current leverage is below the optimal leverage ratio. Therefore, we include a variable in our share repurchase regressions that measures the deviation from the industry median leverage. Leverage is defined as the ratio of long-term debt (Compustat item #9) to total assets (Compustat item #6). We expect this variable to be negatively related to share repurchase activity.

The decision to repurchase shares may also be influenced by the threat of a hostile takeover attempt. Billett and Xue (2007) find a positive relation between share buybacks and takeover attempts. Share buybacks lead to a higher acquisition price because the investors that sell their shares in a buyback are the ones with the lowest reservation price. Companies with a higher risk

of being target of a takeover attempt are therefore more likely to repurchase stocks. We include a dummy variable in our regressions that is equal to one if a company was target of a takeover attempt in the respective year and zero otherwise. The data is taken from Thomson One Banker.

Companies grant executive stock options to their managers and when these options are exercised, firms may buy back shares to balance the dilution effect of the issuance of new securities. Kahle (2002) and Weisbenner (2000) find supporting evidence for this theory for a sample of large US companies. To account for the possibility that companies buy back shares to counterbalance the dilution effect of the issuance of new shares, we follow Kahle (2002) and use the ExecuComp database to calculate the number of options exercised and exercisable by all top managers of the firm.

Fenn and Liang (2001) and Babenko (2009) document a relation between pay-performance sensitivities and share repurchases. In particular, more executive stock options are associated with more share repurchases and less dividends because stock options do not benefit from dividend payments. We follow Core and Guay (2002) and compute the delta and vega of a manager's stock and stock option portfolio. The delta of the manager's portfolio is equal to the sum of the delta of his company stocks plus the overall delta of his option portfolio. We compute the overall delta of his options following Black and Scholes (1973) and assume that the delta of each stock is equal to one.[5] We follow Tchistyi, Yermack, and Yun (2011) and scale delta by common shares outstanding to compute the sensitivity relative to the total market capitalization of the firm. For the calculation of the managers's vega, we only take into account the vega of his options because the vega for stock is typically very

[5] We estimate the one-year stock return volatility using stock price data from CRSP and use it as a proxy for future volatility. Further, we proxy for the risk-free rate by using the 10-year US-treasury rate from the Federal Reserve.

close to zero.[6] We follow Tchistyi et al. (2011) and use $log(1 + vega)$ in our regressions in order to account for the fact that vega is skewed.

We winsorize all variables at the one-percent level. For further details on the variables used, we refer the reader to Table 8.

3.4 Descriptive Statistics

Table 1 presents descriptive statistics of the variables used in the empirical analysis.

[Table 1 here]

CEO Optimistic is a dummy variable that equals one if the company's CEO is classified as optimistic. In 31.8% of all firm-years we classified the CEO as optimistic and zero otherwise. The average firm pays out about 5.1% of total assets to shareholders and distributes 50.7% of the payouts in the form of share repurchases. When looking at the mean value of share repurchases to total assets and dividends to total assets, we observe that the average firm pays out 3.5% in form of share repurchases and 1.6% of total assets through dividends. Total payouts are heavily right skewed as the median firm only pays out 2.8%.

The average firm has about $5.9 billion total assets. Firm size is also strongly right-skewed, as the median firm has total assets of about $1.8 billion. On average a firm has cash holdings of about 11.4% of total assets. Also cash holdings are strongly right-skewed as the median firm has cash holdings of about 5% of total assets. The average firm's market-to-book ratio is about 1.98 while the median firm's market-to-book ratio is only 1.59. Thus, also for the firms market-to-book ratio we see positive skewness. The market leverage

[6] In theory, the vega of a share could be different from zero. However, Guay (1999) finds that the mean vega of an executive's stocks is 0.005. Therefore, we assume the vega of the stocks in a manager's portfolio to be zero.

is on average about 19%, similar to the leverage ratio of the median firm. Deviation from optimal leverage is the deviation from the median leverage of firms that operate in the same industry as the respective firm based on two-digit SIC codes. Firms in our sample period have about 1% lower leverage ratios than the industry median. In 3% of firm-years, firms in our sample were target of a takeover attempt. Delta and Vega of the CEO are the stock and option portfolio sensitivities with respect to a $1 change in the stock price (delta) and a 1% change in the stock return's volatility (vega). The average CEO in our sample receives about 3% of the market value gain resulting from a $1 increase in the stock price. The value of his option portfolio increases by $136,000 following a one-percent increase in the stock returns volatility (not reported). Options excercised is the number of executive stock options exercised relative to common shares outstanding.[7] Option excercises are only minor as they solely comprise 0.2% of common shares outstanding on average. The number of exercisable options is higher as exercisable options account for 1.5% of shares outstandings.

Table 2 presents pairwise correlations between the variables used in the empirical analysis.

[Table 2 here]

We observe that share repurchases over total payouts and share repurchases over total assets is significantly positively correlated with CEO optimism. These correlations are statistically significant at the 1-percent level which is consistent with the hypothesis that optimistic CEOs engage in heavier share repurchase activity because they perceive their company's equity as undervalued. Cash dividends over total assets is negatively correlated with

[7] For the calculation of the total number of executive stock options exercised we take into account all executives that are included in the ExecuComp database in a given year. Usually, these are the five highest ranked executives of a company.

CEO optimism which is supportive for the hypothesis that optimistic CEOs pay less dividends. Total payouts to total assets is positively correlated with CEO optimism suggesting that lower dividend payments by optimistic CEOs are more than outweighed by higher share repurchase activity.

4 Results

In this section, we discuss univariate and multivariate tests of our hypotheses presented in section 2. To analyze the impact of managerial traits on corporate payout policy we first estimate tobit models to analyze if there is a difference between our variables of interest between firms that are managed by optimistic CEOs and firms managed by rational CEOs. In a second step, we compare CEO changes where the new CEO is optimistic to CEO changes where the new CEO is rational to control for unobserved firm characteristics that are constant around the managerial change. We expect optimistic managers to reorganize the payout channel to a larger fraction of share repurchases.

4.1 Bivariate Analysis

Table 3 presents T-tests for the differences in means of the ratios of share repurchases to total payouts, repurchases to total assets, dividends to total assets and total payouts to total assets for firms with optimistic CEOs and firms with non-optimistic CEOs.

[Table 3 here]

We find that the ratio of share repurchases to total payouts is about 10% higher for firms with optimistic CEOs compared to firms with rational CEOs. The difference between these two groups is statistically significant from zero at the one-percent level. The ratio of share repurchases to total assets is 0.7% higher in firms with an optimistic CEO. This difference is also significantly

different from zero at the one-percent level suggesting that optimistic managers do not only reorganize their payouts towards share repurchases but also increase share repurchases in total amounts. The ratio of cash dividends to total assets is about 0.2% lower for optimistic CEOs, while the ratio of total payouts to total assets is 0.5% higher for firms with optimistic CEOs. These two differences are also statistically different from zero at the one-percent level. Overall, the bivariate tests suggest that firms with optimistic CEOs distribute cash to shareholders in different ways compared to firms with non-optimistic CEOs. Firms with optimistic CEOs buy back more shares and pay less dividends. Total payouts are - at least in the bivariate tests - higher for firms with optimistic CEOs relative to firms with non-optimistic CEOs. The results in Table 3 are consistent with hypothesis 1, 2a, 3, and 4b.

4.2 Multivariate Results

To test our hypotheses, we employ a tobit regression framework regressing the different payout ratios on a dummy (OC_i) that equals one if the CEO of firm i is classified as optimistic:[8]

$$\text{Payout ratio}_{i,t} = \alpha + \alpha_{Ind} + \alpha_t + \beta_1 * OC_{i,t} + \beta_2 * X_{i,t} + \epsilon_{i,t}$$

α_{Ind} and α_{Year} are industry and year dummies.[9] We use firm- and manager-specific control variables X_i as described in Section 3.3. Standard errors are clustered on the firm level. Results are reported in Table 4.

[Table 4 here]

[8] Results remain unaffected if we use OLS regressions instead of Tobit and are very similar in both economic and statistical significance.

[9] In all regressions, we follow Malmendier and Tate (2008) and include industry dummies for the following industries: Agricultural Production (SIC 100), Technical (SIC 1000-1799, 8711), Manufacturing (SIC 2000-3999), Transportation (SIC 4000-4899), Trade (5000-5999), and Service (SIC 7000-8710, 8712-8720, 8722-8999).

In the first two models, we find support for our first hypothesis that optimistic CEOs distribute more cash to shareholders in the form of share repurchases. Firms with optimistic CEOs distribute 7.9% more of total payouts in the form of share repurchases when controlling for several firm and manager characteristics as well as time and industry effects. The result is statistically significant at the one-percent level. The signs of the other coefficients are as expected: Larger firms buy back less shares and firms with higher cash holdings pay out more in form of share repurchases. In addition, CEOs with large option holdings and firms that have a large number of exercisable executive stock options outstanding (or exercised stock options) engage in more repurchases. The coefficient for M&A targets is significantly negative which is puzzling. The negative coefficient means that firms that were target of a takeover attempt decrease their fraction of share repurchases. However, theory predicts that these firms should increase the amount of share repurchases to increase the takeover premium.

Next, we test if optimistic CEOs pay out more in form of share repurchases when measured as a fraction of total assets.[10] We find supporting evidence that firms with optimistic CEOs buy back more shares. The average firm that has an optimistic CEO repurchases 0.7% more shares than an otherwise identical firm with a non-optimistic CEOs, when share repurchases are measured as a fraction of total assets. This result is statistically significant at the one-percent level. The result is also economically significant: On average, firms with optimistic CEOs pay out about $41mn more (in terms of median total assets: $11.5mn) in form of share repurchases compared to firms with non-optimistic CEOs. The coefficients of the other control variables in model (4) are similar to the results in model (2). Additionally, we find significant co-

[10] We run the regressions additionally with share repurchases scaled by the market value of equity. Results are qualitatively the same.

efficients for the market-to-book ratio (positive) and the deviation from target leverage (negative), which is in line with prior literature (Dittmar (2000)).

In models (5) and (6) we analyze - analogue to Deshmukh et al. (2013) - if firms with optimistic CEOs pay less cash dividends. Although we find a negative coefficient for CEO optimism in both models, the coefficient is statistically insignificant. The other coefficients are in line with findings in the prior literature: Larger firms pay more dividends while firms that compensate their executive with large option packages pay less dividends. It has to be noted that our findings are contrary to Deshmukh et al. (2013). This could be explained by the different sample and sample period.[11] However, it has to be noted that our results are qualitatively similar to the results in Deshmukh et al. (2013).

Lastly, in models (7) and (8), we analyze how total payouts scaled by total assets differ between firms with optimistic CEOs and firms with non-optimistic CEOs. We find no effect for the optimism dummy on the level of total payouts. This finding is in line with Deshmukh et al. (2013). Further, we find that firms with more cash, a higher market-to-book ratio and with more option based compensation pay out more, while firms that are below their target leverage and firms with higher stock compensation measured by the delta of the CEO pay out less.

Overall, the results in Table 4 are consistent with hypothesis 1 and hypothesis 2a.

[11] In their analysis, Deshmukh et al. (2013) use data from the 1980s and early 1990s. In this time period, cash dividends were the dominant payout source. This has changed in the last twenty years when share repurchases became more dominant. See for example Dittmar (2000).

4.3 CEO Turnover Analysis

To control for unobserved firm characteristics that may impact the decision to buy back shares and are correlated with optimism at the same time, we test whether the payout policy changes after managerial turnover for different types of incoming CEOs. Since changes in a firm's payout policy are not likely to materialize "overnight", we require a minimum of 7 years of data on the firm's total payout and share repurchase volume surrounding the CEO turnover (i.e., three years before and three years after the CEO turnover). This gives sufficient time to implement changes by the incoming CEO and allows for a potential behavioral bias to manifest. Therefore, we drop all turnover where we have not the complete seven year period in Compustat or ExecuComp. Further, our sample is reduced because of missing data for share repurchases, cash dividends, and the other control variables (section 3.3) necessary in our regressions and we end up with 619 CEO changes.

Since we intend to analyze the effect of CEO optimism on the firm's payout- and share repurchase activity, we require at a minimum that the successor can be classified as rational or optimistic by our classification algorithm above (section 3.1). We were not able to classify the successor in 278 cases. Thus we are left with a set of 341 CEO changes. In 116 cases we were also able to classify the predecessor, in 225 we were not able to classify the predecessor. In detail we have the following groups of CEO turnover:

1. predecessor was rational → successor was rational (58 observations)
2. predecessor was optimistic → successor was rational (26 observations)
3. predecessor was unknown → successor was rational (159 observations)
4. predecessor was optimistic → successor was optimistic (25 observations)
5. predecessor was unknown → successor was optimistic (66 observations)

6. predecessor was rational → successor was optimistic (7 observations)

Since we want to infer the impact of the incoming CEO's managerial trait on the firm's payout- and share repurchase activity, we combine group 2 & 3 (rational incoming CEO) and compare them to groups 5 & 6 (optimistic incoming CEO). We do not include groups were the predecessor and successor were of the same type. Imposing no restrictions on the predecessor thereby is conservative as it introduces noise that, if anything, would diminish our findings.

The tests are based on a difference-in-difference methodology. The procedure is illustrated in Figure 1.

[Figure 1 here]

In particular, we are looking at the seven year window surrounding the turnover event. We calculate averages of the different payout ratios three years before and after the turnover and compute the difference between these averages. Lastly, we analyze if these difference vary for CEO changes where the new CEO is optimistic relative to CEO changes where the incoming CEO is non-optimistic.

Figure 2 presents the mean values of the variables of interest for the years [-3,+3] around CEO turnover.

[Figure 2 here]

In Panel A, we see - consistent with our first hypothesis - that the fraction of share repurchases to total payouts increases after CEO turnover with optimistic successors while the opposite is true for turnover with rational successors. The evidence for total payouts in panel B is less clear: While the

level is different before the turnover, total payouts increase slightly after an optimistic CEO is hired, while payouts decrease after the hiring of a rational manager. In Panel C, we observe that the total level of share repurchases - when measured in terms of total assets - increases after the hiring of an optimistic manager, while it decreases when a rational manager is hired. However, in year 3 after the turnover this pattern reverses. In Panel D, the evolution of dividends after CEO turnover is shown. Dividends seem to be unaffected by the type of the new CEO. The graphical evidence presented in Figure 2 is consistent with hypothesis 1 and 2a. It seems that optimistic managers increase the level of share repurchases both in terms of total payouts and total assets after being hired. There is no clear pattern in total payouts over total assets. Dividend payments seem to be unaffected by the new manager type.

To test the hypotheses, we employ the following regression framework:

$$\Delta PayoutRatio_{i,t} = \alpha + \alpha_{Ind} + \alpha_t + \beta_1 * OC_{i,t} + \beta_2 * X_{i,t} + \epsilon_{i,t}$$

α_{Ind} and α_{Year} are industry and year dummies. We use the same firm- and manager-specific control variables X_i as in Table 4. X_{it} includes both the mean of the respective control variables before and after the CEO changes as well as changes in these means to control for a potential change in other factors impacting payout decisions. Standard errors are clustered on the firm level. Results are reported in Table 5.

[Table 5 here]

The results in Table 5 confirm our previous findings: The pre-turnover to post-turnover change in the fraction of share repurchases to total payouts is significantly higher if the successor is classified as optimistic. In unreported results, we find that firms with higher market-to-book ratios, firms where the

CEO's vega is higher, and firms with more executive options outstanding increase the share repurchase fraction after the turnover to a greater extent. Looking at the changes of the variables we find that a larger increase in asset size is negatively related to the fraction of payouts distributed as share repurchases which is consistent with the idea that larger firms pay more dividends. To test if optimistic managers increase the amount of share repurchases not only relative to rational managers but also overall, we test the null hypothesis that the sum of the constant term and the optimism coefficient is equal to zero with a F-test (not reported). We can reject the null hypothesis at the one-percent level, suggesting that optimistic managers increase the fraction of payouts that is paid in form of share repurchases after being hired. Overall, we find strong support for our main hypothesis that optimistic managers reorganize the payout channel to a larger fraction of share repurchases.

The results in Table 5 (models (3) and (4)) suggest that optimistic managers also increase the total amount of share repurchases when measured in terms of total assets after being hired. We find that optimistic managers increase share repurchases by about one percentage point. The result is statistically significant at the ten percent level. When looking at the other control variables (not reported in the table) we observe that firms with more cash, firms with higher market-to-book ratios, firms with CEOs that have higher vegas, and firms with more executive stock options outstanding in the pre-turnover period increase share repurchases. The change in total assets between the post- and pre-turnover period is negatively related with share repurchases while the change in vega and the market-to-book ratio is positively related to the total amount of share repurchases.

In the models (5) and (6), the effect of optimism on dividends is analyzed. The effect is insignificant, confirming our results in Section 4.2. The effect of the other control variables shows that firms with higher market-to-book ratios

and firms with higher CEO deltas more often increase their dividend payout. Firms with strong asset growth between the two periods pay less dividends, and firms with higher market-to-book ratios and higher vegas in the post-turnover period pay more dividends.

In models (7) and (8) we regress the change in total payouts on optimism of the incoming CEO. Again, we find no significant relation between CEO optimism and total payouts suggesting that optimistic managers reorganize the payout channel to a higher share repurchases fraction while the change in overall payouts is not significantly different for a CEO turnover with an optimistic successor compared to a turnover with a rational successor. Turning to the control variables we find that firms with higher market-to-book ratios and with CEOs with higher vegas increase payouts and firms where the management owns more exercisable options decrease the payout ratio. Also, firms with a larger increase in size decrease payouts while firms with larger increases in the market-to-book ratio and the CEO's vega increase payouts.

5 Robustness

5.1 Alternative Measures of Optimism

We test our results for robustness with respect to different optimism measures in Table 6.

[Table 6 here]

In particular, we consider different moneyness thresholds for the original Malmendier and Tate (2005a) classification, we distinguish between Pre- and Post-optimistic and use alternative methods to identify optimism. Table 6 replicates model 2 of Table 4 using these alternative classification methods. We start by identifying CEOs as optimistic if they ever hold an option until

one year prior to expiration which is at least 70% (model 1) or 100% (model 2) in-the-money whereas the original classification uses a threshold of 40% moneyness. We find that our results are robust to different moneyness thresholds: Results are even stronger if the moneyness threshold is higher. In particular, if we use a 70% (100%) threshold, firms with optimistic CEOs distribute 8% (10%) more of their payouts in the form of share repurchases (compared to difference of 7.8% with a threshold of 40%). Results are statistically significant at the one percent level. Thus, our results are robust to different moneyness thresholds used to identify managers as optimistic.

Second, we follow Malmendier and Tate (2008) and use the point in time when a manager showed optimistic behavior for the first time to distinguish between Pre- and Post-optimistic. By doing this we check whether optimism can be treated as a time-invariant personal characteristic. *Pre-optimistic* is a dummy variable equal to one during the time period before the manager held options until maturity for the first time. *Post-optimistic* is a dummy equal to one thereafter. We find in model 3 that firms with optimistic CEOs pay out significantly more in form of share repurchases confirming our previous results and supporting the notion that optimism is a time-invariant characteristic.

Third, we use the *Holder67* measure proposed by Malmendier and Tate (2005a). This measure classifies CEOs as optimistic if they hold options that are at least 67% in-the-money five years after they have been granted to the manager. A manager needs to show this behavior at least twice during his/her tenure. Our results are economically weaker using this measure but still statistically significant at the ten percent level.

Lastly, we use the method proposed by Sen and Tumarkin (2009). This method relies on the managers' stock holdings and identifies managers as optimistic if their stock holdings relative to their salaries exceed the median stock holdings to salary ratio in the industry. The intuition behind this method is

identical to the method introduced by Malmendier and Tate (2005a). Executives are typically poorly diversified and the reason for keeping high exposures to a manager's firm is likely to be optimism.[12] In model 5 we show that our results hold when using the method proposed by Sen and Tumarkin (2009).

5.2 Other Managerial Characteristics

Bertrand and Schoar (2003) show that managerial style affects various corporate financial policies. In particular, they show that manager fixed effects are important in explaining policies such as corporate investment. Following this research, a number of studies relates corporate policies to specific manager characteristics such as age or gender. For example, Huang and Kisgen (2013) show that male managers pursue risker financing decisions. To rule out that optimism may be correlated with other CEO characteristics that also potentially affect payout decisions, we test our results for robustness in Table 7.

[Table 7 here]

The effect of optimism on share repurchases prevails after including other personal characteristics of the CEO. We find that besides optimism especially younger CEOs and CEOs with a PhD use share repurchases as payout channel.

6 Conclusion

This paper analyzes the impact of managerial optimism on corporate payout policy. We investigate if companies with optimistic CEOs prefer share repurchases over dividends when paying out excess resources to shareholders. Optimistic managers overestimate their own abilities in managing the firm and

[12] The ratio with respect to salary is used because Core and Guay (2002) show that many firms use minimum stock holdings requirements for their managers that are stated in terms of salary.

thereby overestimate the value of the firm compared to the market. This makes share repurchases a more attractive payout channel relative to dividends. With share repurchases, a manager can benefit from mispricings and transfer wealth from short-term traders to long-term shareholders. However, there is a counterbalancing effect of optimism on share repurchases and on payout policy in particular. Because optimistic managers are reluctant to issue debt or equity because they perceive it as unduly costly, optimistic managers might pay out less in order to finance future investment projects internally. This would predict a negative influence of optimism on total payouts.

We analyze a sample of S&P 1,500 firms between 1992 and 2010 and find that optimistic managers engage in more repurchase activity when measured as a fraction of total payouts and of total assets. We find no effect of optimism on dividends and total payouts. Our findings are robust to unobserved, time invariant firm characteristics that might be correlated with optimism and payouts at the same time.

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Appendix

A.1 Figures

Figure 1: Difference-in-Difference around CEO Turnover

We analyze the payout policy around CEO changes to identify the effect of CEO optimism on payout policy. We measure average payout ratios in the three years before and after the turnover event and analyze if the difference-in-difference varies for the type of the new CEO.

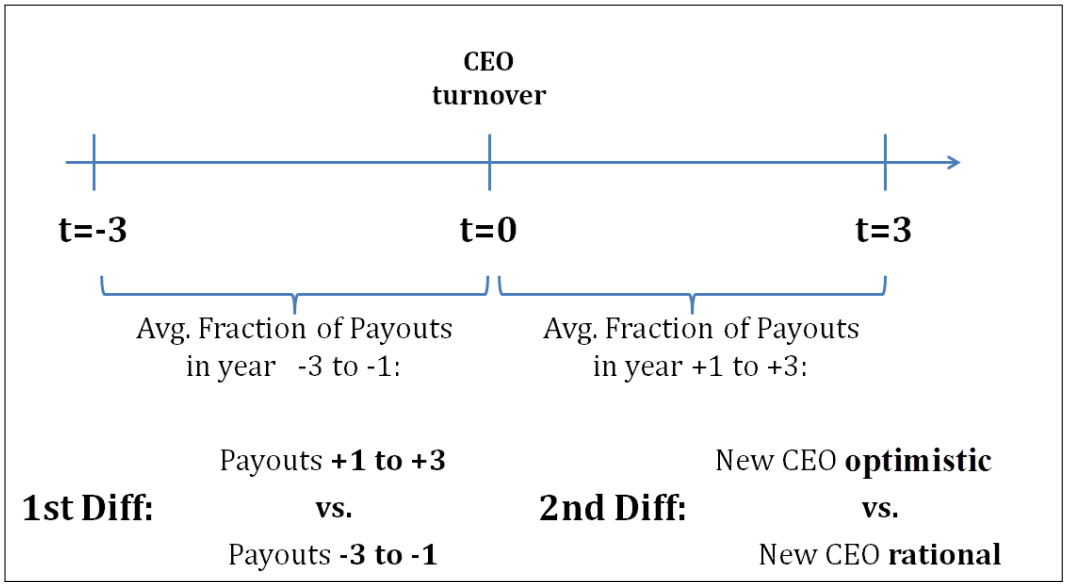
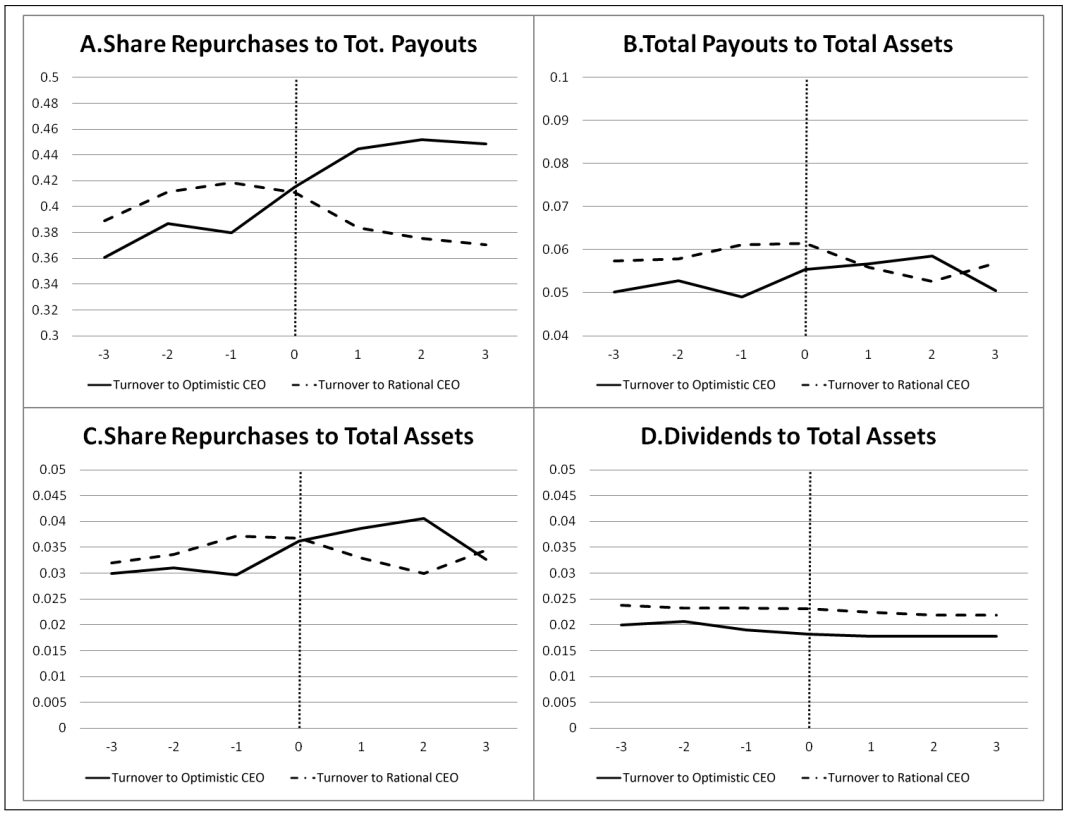


Figure 2: Evolution of Payout Components Following CEO Turnover

This figure shows the average reaction of share repurchases to total payouts (Panel A), total payouts to total assets (Panel B), share repurchases to total assets (Panel C), and cash dividends to total assets (Panel D) following a CEO turnover. The event window has a length of seven years, year 0 is the year of the turnover. Variable definitions are given in Table 8.



A.2 Tables

Table 1: Summary Statistics

In this table, summary statistics are reported for a sample of 1313 firms between 1992 and 2010. Variable definitions are provided in Table 8. All variables are winsorized at the one-percent level at both ends of the distribution except the logarithm of vega.

	Summary statistics					
	Mean	**Median**	**SD**	**Min**	**Max**	**Obs**
CEO optimistic	0.318	0.000	0.466	0.00	1.00	10,378
Repurchases over Total Payouts	0.507	0.551	0.411	0.00	1.00	10,378
Tot. Payouts over Total Assets	0.051	0.028	0.063	0.00	0.34	10,378
Repurchases over Total Assets	0.035	0.010	0.056	0.00	0.28	10,378
Dividends over Total Assets	0.016	0.011	0.019	0.00	0.11	10,378
Total Assets (in bn USD)	5.866	1.752	10.512	0.02	56.13	10,378
Cash Holdings	0.114	0.050	0.146	0.00	0.78	10,378
Market-to-Book Ratio	1.971	1.590	1.216	0.72	9.47	10,378
Market Leverage	0.194	0.187	0.152	0.00	0.80	10,378
Dev. from Target Leverage	-0.009	-0.026	0.136	-0.43	1.42	10,378
M&A Target	0.033	0.000	0.178	0.00	1.00	10,378
Delta (CEO)	0.029	0.012	0.045	0.00	0.21	10,378
Log(1 + Vega) (CEO)	4.116	4.235	1.661	0.00	9.25	10,378
Exec. Options Exercised	0.002	0.001	0.004	0.00	0.03	10,378
Exec. Options Exercisable	0.015	0.008	0.023	0.00	0.23	10,378

Table 2: Correlation Matrix

This table reports pairwise correlations for the variables used in our analyses. The sample includes 1313 firms between 1992 and 2010. Variable definitions are given in Table 8.

	Share Repurchases/TP	Share Repurchases/TA	Dividends/TA	Total Payouts/TA	CEO Opt.	Total Assets	Cash Holdings	Free Cash Flow	Market-to-Book	Leverage	Dev. Leverage	M&A	Delta (CEO)	Vega (CEO)	Opts. Exercised	Opts. Exercisable
SR/TP	1.00															
SR/TA	0.52^{***}	1.00														
Div./TA	-0.35^{***}	0.07^{***}	1.00													
TP/TA	0.36^{***}	0.94^{***}	0.39^{***}	1.00												
CEO Opt.	0.12^{***}	0.05^{***}	-0.04^{***}	0.03^{***}	1.00											
TA	-0.09^{***}	-0.03^{***}	0.14^{***}	0.01	-0.03^{**}	1.00										
Cash	0.31^{***}	0.25^{***}	-0.05^{***}	0.22^{***}	0.01	-0.14^{***}	1.00									
FCF	0.13^{***}	0.40^{***}	0.27^{***}	0.46^{***}	0.02^{*}	0.02^{*}	0.00	1.00								
MTB	0.19^{***}	0.37^{***}	0.24^{***}	0.42^{***}	0.07^{***}	-0.04^{***}	0.39^{***}	0.22^{***}	1.00							
Lev.	-0.19^{***}	-0.17^{***}	-0.05^{***}	-0.16^{***}	-0.01	0.08^{***}	-0.43^{***}	-0.23^{***}	-0.31^{***}	1.00						
Dev. Lev.	-0.08^{***}	-0.07^{***}	-0.09^{***}	-0.08^{***}	0.03^{***}	-0.02	-0.26^{***}	-0.17^{***}	-0.18^{***}	0.86^{***}	1.00					
M&A	-0.03^{**}	-0.01	-0.02	-0.01	0.00	0.00	-0.02	-0.04^{***}	-0.02^{*}	0.05^{***}	0.04^{***}	1.00				
Delta	0.11^{***}	0.01	-0.11^{***}	-0.02^{*}	0.13^{***}	-0.20^{***}	0.12^{***}	-0.02	0.02	-0.10^{***}	-0.06^{***}	0.02	1.00			
Vega	0.11^{***}	0.19^{***}	0.10^{***}	0.20^{***}	0.10^{***}	0.53^{***}	0.06^{***}	0.13^{***}	0.24^{***}	-0.04^{***}	-0.03^{**}	0.00	-0.09^{***}	1.00		
O. Excd.	0.17^{***}	0.13^{***}	-0.10^{***}	0.09^{***}	0.06^{***}	-0.14^{***}	0.12^{***}	0.03^{**}	0.10^{***}	-0.07^{***}	-0.01	-0.01	0.10^{***}	-0.03^{**}	1.00	
O. Exable.	0.18^{***}	0.06^{***}	-0.17^{***}	0.00	0.03^{**}	-0.19^{***}	0.14^{***}	-0.04^{***}	-0.09^{***}	-0.01	0.04^{***}	0.01	0.24^{***}	0.00	0.29^{***}	1.00
N	10,362															

Table 3: T-Tests - Differences in Payout Variables

This table reports T-tests for the differences in means between the mean-levels of payout variables for optimistic and rational CEOs. T-statistics are reported in brackets. All variable definitions are given in the Appendix (Table 8). *,**,*** indicate statistical significance at the 10%,5%,1% level.

	Optimistic		
	0	**1**	**Diff. in Means**
Repurchases over total payouts	0.474	0.577	−0.103***
			(0.009)
Repurchases over total assets	0.033	0.039	−0.007***
			(0.001)
Dividends over total assets	0.016	0.014	0.002***
			(0.000)
Tot. payouts over total assets	0.050	0.055	−0.005***
Observations	7,088	3,305	

Table 4: Managerial Optimism and Payout Policy

This table presents tobit regressions of different payout ratios on CEO optimism and various firm and manager control variables. In models (1) and (2) the dependent variable is the ratio of dollars spent on share repurchases over total payouts. In models (3) and (4) the dependent variable is the ratio of dollars spent on share repurchases over total assets, in models (5) and (6) the dependent variable is the ratio of cash dividend over total assets and in models (7) and (8) the dependent variable is the ratio of total payouts over total assets. The sample includes 1313 firms between 1992 and 2010. Variable definitions are given in the Appendix. All models include industry and year fixed effects. Standard errors are heteroskedasticity robust and clustered at the firm level to account for non-independent observations within firms. *, **, *** indicate statistical significance at the 10%, 5% and 1% level respectively.

	(1) SR to TP	(2) SR to TP	(3) SR to TA	(4) SR to TA	(5) DIV to TA	(6) DIV to TA	(7) TP to TA	(8) TP to TA
Optimistic	0.094***	0.079***	0.007**	0.004***	−0.002	−0.002	0.003	0.000
	(0.024)	(0.022)	(0.003)	(0.001)	(0.001)	(0.001)	(0.003)	(0.001)
Size		−0.037***		−0.003***		0.003***		0.000
		(0.009)		(0.001)		(0.001)		(0.001)
Cash holdings		0.712***		0.089***		−0.027***		0.065***
		(0.079)		(0.008)		(0.006)		(0.010)
Free CF to Equity		0.072		0.102***		0.052***		0.127***
		(0.063)		(0.012)		(0.005)		(0.014)
Market-to-Book		0.012		0.011***		0.005***		0.015***
		(0.008)		(0.002)		(0.001)		(0.002)
Dev. Target Leverage		−0.118		−0.023***		−0.013***		−0.020***
		(0.074)		(0.006)		(0.005)		(0.005)
M&A Target		−0.067**		−0.003		0.000		0.000
		(0.029)		(0.004)		(0.001)		(0.003)
Delta (CEO)		0.376*		−0.014		−0.023		−0.044***
		(0.223)		(0.014)		(0.016)		(0.012)
Vega (CEO)		0.049***		0.006***		−0.001***		0.003***
		(0.007)		(0.001)		(0.000)		(0.001)
Options Exercised		6.785***		0.810***		−0.280***		0.443**
		(1.405)		(0.211)		(0.088)		(0.192)
Options Exercisable		0.744*		0.013		−0.055**		−0.001
		(0.416)		(0.030)		(0.022)		(0.021)
Obs.	10,393	10,393	10,393	10,393	10,393	10,393	10,393	10,393
Pseudo R^2	0.084	0.148	0.077	0.217	0.021	0.084	0.030	0.128
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 5: Managerial Optimism and Payout Policy - Diff-in-Diff Around CEO Turnover

This table presents regressions of differences in payout ratios before and after CEO turnover on CEO optimism. In models (1) and (2) the dependent variable is the ratio of dollars spent on share repurchases over total payouts. In models (3) and (4) the dependent variable is the ratio of dollars spent on share repurchases over total assets. In models (5) and (6) the dependent variable is the ratio of cash dividend over total assets and in models (7) and (8) the dependent variable is the ratio of total payouts over total assets. The sample includes 258 CEO changes between 1992 and 2010. The main variable of interest is *New CEO Optimistic* which is equal to one of the new CEO is classified as optimistic. When indicated, we include all control variables as means before and after the CEO change as well as time and industry fixed effects. Variable definitions are given in the Appendix. Standard errors are heteroskedasticity robust and clustered at the firm level to account for non-independent observations within firms. *, **, *** indicate statistical significance at the 10%, 5% and 1% level respectively.

	SR to TP		**SR to TA**		**DIV to TA**		**TP to TA**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
***New* CEO Optimistic**	0.108***	0.094***	0.010*	0.010*	0.000	−0.001	0.011	0.008
	(0.040)	(0.035)	(0.006)	(0.005)	(0.001)	(0.001)	(0.007)	(0.006)
Obs.	258	258	258	258	258	258	258	258
$R^2 Adj.$	0.099	0.363	0.112	0.492	0.103	0.430	0.118	0.537
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control Variables	No	Yes	No	Yes	No	Yes	No	Yes

Table 6: Alternative Optimism Classifications

This table reports tobit regressions using the ratio of share repurchases over total payouts as the dependent variable. *Optimistic 70* and *Optimistic 100* are indicator variables that equal one if the CEO is classified as optimistic, i.e. if the CEO ever held an option until the final maturity year, which is at least 70 or 100% in the money and zero otherwise. *Holder67* is an indicator variable that is equal to one if the CEO did not exercise options that were at least 67% in the money in their fifth year at least twice during his/her tenure. *Pre-Optimistic* and *Post-Optimistic* indicate the time period before a CEO ever held an option until the final maturity year, which is at least 40% in the money and the the time period after this activity, respectively. Voluntary Holder is an indicator variable that equals one if CEOs voluntarily hold more stocks of their company than required by company constitutions. The regressions furthermore include all control variables used in Table 4. All other variables are defined in Table 8. The regressions include time and industry dummies. Standard errors are heteroskedasticity robust and clustered at the firm level to account for non-independent observations within firms. *, **, *** indicate statistical significance at the 10%, 5% and 1% level respectively.

	(1)	**(2)**	**(3)**	**(4)**	**(5)**
Optimistic (70)	0.081***				
	(0.026)				
Optimistic (100)		0.103***			
		(0.028)			
Pre-Optimistic			0.066**		
			(0.029)		
Post-Optimistic			0.070**		
			(0.029)		
Holder 67				0.039*	
				(0.020)	
Voluntary Holder					0.026*
					(0.014)
Observations	10,393	10,393	10,369	6,086	17,525
Pseudo R^2	0.132	0.133	0.136	0.146	0.147
Control Variables	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes

Table 7: CEO Characteristics

This table reports tobit regressions using the ratio of share repurchases over total payouts as the dependent variable. *Optimistic* is an indicator variable that equals one if the CEO is classified as optimistic, i.e. if the CEO ever held an option until the final maturity year, which is at least 40% in the money and zero otherwise. *Female* is a dummy variable that is equal to one if the CEO is female. *Ph.D.* is a dummy variable if the CEO holds a Ph.D. degree. *Age* is the age of the CEO. *Delta* measures the sensitivity of the CEO's overall option and stock portfolio to price movements of the company's stock. *Log(Vega)* measures the sensitivity of the CEO's overall option and stock portfolio to volatility changes of the company's stock. The regressions furthermore include all control variables used in Table 4. All variables are defined in table 8. The regressions include time and industry dummies. Standard errors are heteroskedasticity robust and clustered at the firm level to account for non-independent observations within firms. *, **, *** indicate statistical significance at the 10%, 5% and 1% level respectively.

	(1)
Optimistic	0.079***
	(0.025)
Age	−0.007***
	(0.002)
Female	0.058
	(0.055)
Ph.D.	0.171***
	(0.049)
Delta	0.559**
	(0.238)
Log(Vega)	0.048***
	(0.008)
Observations	8,389
Pseudo R^2	0.151
Year Fixed Effects	Yes
Industry Fixed Effects	Yes
Control Variables	Yes

Table 8: Variable Definitions

Variable Name	Definition and/or Compustat item
CEO characteristics and portfolio sensitivities:	
Optimistic	Equal to one if a manager holds executive stock options until the last year of maturity that are at least 40% in-the-money.
Option Value	$\left[Se^{-dt}N(Z) - Xe^{-rt}N(Z - \sigma T^{1/2})\right]$ where: $Z = \left[ln\left(S/X\right) + T\left(r - d + \sigma^2/2\right)\right]/\sigma T^{1/2}$ N = cumulative probability function for the normal distribution S = price of the underlying stock X = exercise price of the option σ = expected stock-return volatility over the life of the option r = natural logarithm of the risk-free rate T = time to maturity of the option in years d = natural logarithm of expected dividend yield over the life of the option
Delta	Overall delta of the option and stock portfolio held by the CEO divided by total shares outstanding. The individual stock delta is one per definition, the delta of an individual option is defined as $e^{-dT}N(Z)$.
Vega	$e^{-dT}N^{'}(Z)ST^{1/2} * (0.01)$ where $N^{'}$ =normal density function.
Firm characteristics - Compustat:	
Shares repurchased (in USD)	Purchase of common and preferred stock (Item #115) - change in redemption value of preferred stock (Item #57).
Repurchase to total payouts	Shares repurchased (in USD) divided by total payouts (Item #115 minus Δ (Item #57) plus Item #127).
Repurchase to total assets	Shares repurchased (in USD) divided by total assets (Item #6).

Continued on next page

Table 8 – continued from previous page

Variable Name	Definition and/or Compustat item
Dividends to total assets	Cash dividends (Item #127) divided by total assets (Item #6).
Total payouts to total assets	Total payouts (Item #115 minus Δ (Item #57) plus Item#127) divided by total assets (Item #6).
Total assets	Item #6.
Firm size	log(Total assets).
Leverage	Long-term debt (Item #9) divided by total assets (Item #6).
Market-to-book ratio	Market value of the firm (Item #199 * Item #25 + Item #10 + Item #181) divided by total assets (Item #6).
Market value of equity	(Item #199 * Item #25 + Item #10).
Cash	Cash and marketable securities (Item #1) to total assets (Item #6).
Other firm characteristics:	
Options exercised	Total number of options exercised (Execucomp variable OPT_ EXER_NUM) per company divided by common shares outstanding.
M&A target	Dummy variable equal to one if the company was target of a takeover attempt in the respective year. Data source: *Thomson One Banker*

Appendix

A Optimism Classification

We follow Malmendier and Tate (2005) and classify executives as optimistic if they ever hold an option until one year before expiration even though the option is at least 40% in the money. Therefore, to identify executives as optimistic we need detailed information about the portfolio of executive stock option holdings for each executive at different points in time. Before 2006, ExecuComp contains information on option holdings only in an aggregated form and not detailed for each position of the option portfolio. Therefore, we use information on option grants and option exercises in order to infer detailed information on option portfolios including time to maturity and strike price. Option grants are provided in a detailed manner in the ExecuComp tables STGRTTAB and PLANBASEDAWARDS. Option exercises are given in an aggregated form in the table ANNCOMP. Thus, ExecuComp does only state how many options were exercised but not from which option grant. Therefore, we follow Hall and Liebman (1998) and assume a first-in first-out (fifo) allocation rule in order to infer the option holdings per year.

In doing so, we follow Hall and Liebman (1998) and make the following assumptions:

1. Missing information on option grants.

For each option grant we require the number of options granted, the expiration date and the exercise price. Information on option grants is given in the ExecuComp tables STGRTTAB (until 2006) and PLANBASEDAWARDS (from 2006 onwards). Information on the expiration date of the grant is contained in the table OUTSTANDINGAWARDS. When exercise dates are missing, we assume that the option expires ten years after the grant date as the

median maturity for all option grants is ten years. When the grant date is missing, we assume that the options are granted at fiscal year end. When the exercise price is missing, we assume that the options are granted at the money and thus replace missing exercise prices with the stock price of the company at the grant date.[1]

2. Inconsistencies in granted options between PLANBASED-AWARDS, STGRTTAB and ANNCOMP

We compare whether the number of options granted reported in the tables STGRTTAB and PLANBASEDAWARDS matches with the information given in the annual compensation table ANNCOMP. In approximately 95% of observations this is the case. For the remaining observations only general information on granted options is given in ANNCOMP but no detailed information is available in STGRTTAB or PLANBASEDAWARDS. In these cases, we assume that the options are granted in a single grant at the money at fiscal year end.

3. Missing years in compensation reporting

We check whether there are missing years in the compensation reporting for managers in ExecuComp (for example if compensation is reported for a manager in 1994 and 1996 but not in 1995). If this is the case, we do not know how many options were granted or exercised in the missing years and we only observe the total number of options held in the year following the missing years. When there is only a gap of one year, the missing information can be obtained by comparing the option holdings of the year before the gap and the year following the gap. When the number of options held is larger in the year following the gap we assume that the additional options are granted in a single

[1] The stock price at the grant date is included in the ExecuComp database as the variable "mktpric". If this variable is not available we use instead the CRSP stock price of the company at the grant date.

grant at the money at fiscal year end of the missing year. When the number of options in the following year is smaller than in the year before the gap, we assume that the difference is exercised in the missing year. Thereby we apply the first-in first-out principle and assume that the oldest options are exercised first.

4. Initial option holdings

ExecuComp contains data on executive compensation starting in 1992. We follow Hall and Murphy (2002) and restrict our sample to managers that are included in ExecuComp ten years after ExecuComp's initial year, that is, 2002, and the years thereafter. This ensures that we can backtrack option grants and exercises for managers for a sufficient period of time. The reasoning behind this is that executive stock options typically have a maturity of ten years and including only executives in 2002 or thereafter makes sure that the option portfolios that we compute using the fifo technique are not biased by imposing too many assumptions on initial option holdings. Hereby, we ensure that the option portfolios we analyze include reliable information on maturity and strike price.

However, also managers that appear in ExecuComp for the first time after 2002 sometimes already have initial stock option holdings for which we do not have information on the strike price and the maturity. We follow Hall and Liebman (1998) and assume that these options are granted three years earlier and have seven years left until expiration (i.e., they are granted with a ten year maturity). We further assume that the options are granted at the money at fiscal year end.

5. Inconsistencies in option holdings between fifo-algorithm and ANNCOMP

Sometimes the fifo-algorithm results in a different number of options held by the executive than the number reported in the annual compensation table ANNCOMP. If this is the case, we follow Hall and Liebman (1998) and impose the following assumptions to the option holdings. (i) When the number of options held by the executive given in ANNCOMP is smaller than the number computed by the fifo-algorithm, we assume that either some exercises are missing in ExecuComp or that some options expired. Therefore, we subtract the difference from the oldest option grants. (ii) When the number of options held given in ANNCOMP is larger than the number computed by the fifo-algorithm, we assume that too many options were exercised and add back the exercised options until both numbers match. If it is insufficient to add back the exercised options to reach the number reported in ANNCOMP, the option holdings are rescaled proportionally such that they match with the number of options held given in ANNCOMP.

6. Adjustment for stock splits

The number of options held and the exercise price need to be adjusted for stock splits. We obtain information on stock splits directly from ExecuComp. When this information is missing we assume that there is no stock split in the given year.

7. Chance to reveal optimism

As discussed above, an executive needs to hold options until one year before expiration in order to be classified as optimistic. If ExecuComp does not cover this time period or if the manager leaves the firm before, there is no chance that optimism can be identified. Therefore, we exclude all executives that have no chance to reveal themselves as being optimistic.

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Erklärung gem. §12 Abs. 4 über die genutzten Hilfsmittel

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Berlin, 24. September 2014

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